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THE CONSERVATION OF OUR FISHERIES.

By WILL F. THOMPSON.

Fisheries are subject to depletion because of too intense exploitation, as has been proved in Europe and in our own country. It is the duty of the government, as the one element in the situation which is concerned with the perpetuation of the fisheries, to be able to recognize depletion, to know how to prevent it, and how best to promote the fisheries. It implies knowledge, perhaps not of what we are fond of terming pure science, but rather of applied, although the things to be applied are frankly still in large part to be discovered. Men engaged in educational work are almost invariably engrossed in the more abstract branches of science, and the commercial firms are thus far not interested in carrying on research save for the purpose of furthering the methods of utilization of the products. It is therefore left very largely to governmental authorities, on whom the responsibility of regulation rests, to pursue the subject.*

*See Fish Bulletin No. 2 for a more extensive discussion of this subject.

But what are the problems involved, and what must be done to recognize depletion? A fishery is, one may say, the reaping of a harvest which has been sowed by Nature, and is subject to great natural fluctuations and has unknown power of resistance in the face of continual reaping. The primitive man who went into the rice swamps and gathered his rice, without thought of how it was sowed, or how long it took to grow, was no worse than we are in our primitive attitude regarding our fisheries. The failure of his crop threatened his livelihood, yet he knew nothing regarding the causes of the failure, nor the fluctuations which might occur. What were these changes, were they due to his continual reaping, were they preventable, or might they be foretold? Just so we are asking today, what are these great fluctuations in our fisheries which may mean the prosperity or ruin of our industry, and how may they be prevented or foretold? If we can not cultivate, how may we preserve? They are elemental questions, indeed, to be asking on the threshold of an era of exploitation.

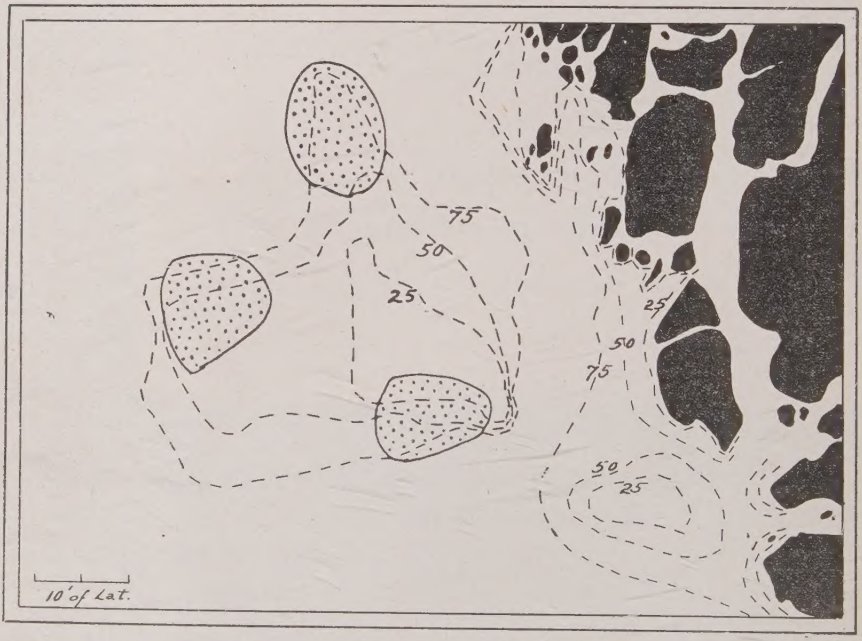


Fig. 18. Diagram of halibut bank in the North Pacific, illustrating the areas within which halibut are considered abundant enough to justify fishing. Depths shown by contour lines, fishing area by stippled spaces.

Men in general do not know what they are dealing with when they pursue a fishery for a certain species. Thus the conception that a species is as inexhaustible as the ocean is large is an erroneous one. The fish in the sea are distributed as unevenly throughout its parts as wild animals are on the land, with this qualification, that only the borders are inhabited by them to any extent. Thus a halibut fishery exists only on particular small areas called banks, or parts of banks, along the edge of the continental self in from thirty to a hundred and fifty fathoms where the conditions are suitable. In fact, just as mountain sheep are limited in their range, so are the halibut.

Then what strain will a species stand? Some think that the capacity of a species is limitless, because of the great number of eggs each individual produces. The halibut lays over a million and a quarter eggs every year of its breeding life, perhaps ten million in all, and the male produces the fertilizing sperm for the same; but this abundance of eggs merely foreshadows many dangers to the young, for from these ten million need come but two mature animals to maintain the species. If there were constantly more than necessary to maintain the numbers of the species, then the resultant increase must, however slight, eventually overcrowd the waters of the sea; and if there were ever so small a lack every year, then the species must vanish ultimately. Man's influence, however slight, like weighted dice in a game, might well, in the end make loss inevitable if it were not for the probability that many forces come into play to favor threatened species. Are those forces potent enough to counterbalance man's influence? Do we know that they are sufficient to avert final loss?

But has there ever been such a loss? Have not men fished for many centuries in the waters of Europe without over-fishing? Why should depletion occur now rather than long ago? But we know that this very thing has happened, and that there is good reason why it should have happened in our day. The great plaice fisheries in the North Sea have been proved over-fished, and in our own waters the halibut fisheries and those for the salmon of the Frazer are good examples of the same. And the reasons are not far to seek. They may be found in the relatively recent invention of the canning process, in the use of steam and gasoline for transportation, and in the use of ice and cold storage methods of preserving food. Salmon from the Frazer is known in Africa and Mexico nearly as well as we know it in America. Halibut taken by steamers and gasoline-driven boats in the Pacific is carried by express trains across the continent and across the Atlantic to England in a fresh condition. The cold-storage and the canning of fish have abolished boundaries and "off-seasons" in so far as many species are concerned. The net result of all this has been the recent vast enlargement of the market, and with that has come the equally vast enlargement of the fishing industry. This marvelous growth of our fisheries has not been appreciated, I am sure. Our sardine fishery, totaling in 1917 over 100,000,000 pounds, has arisen within the last four years. The great halibut fishery, which reached a maximum of 70,000,000 pounds a year, began in 1890, and is now on the decline. What will the future show to us in this regard? Well may we think seriously, and consider our words when we feel tempted to say that the resources of the sea are inexhaustible. The population to be fed may double its numbers in the next fifty years, and transportation may become twice as efficient. What will happen then?

And if the total catch continues to increase, as it has in the past, how may we recognize the commencement of depletion? First of all we must discount in our statistics the marvelous growth in apparatus and equipment, and discover whether a greater effort is required each year to gather the same amount of fish; in other words, ascertain whether decreased abundance necessitates greater effort. This means the abandonment of the old statistical ideal of portraying the magnitude of the industry, and substituting for it a more rational one of the observation of the real abundance of the fish.

But when a decrease is discovered, we must know whether it is a natural one or due to over-fishing, and we must know in time to take remedial measures, not when commercial extinction has solved our doubts. For there are great fluctuations in abundance (of very different extent in the various species) which are not the result of man's efforts but of natural causes, and a decrease in numbers of fish because of such is, of course, not permanent, any more than the causes are. To know the character of such a decrease implies a study of the biology of the species, which provides a distinctive mark for the results of over-fishing in many cases, if not in all. It also implies advancement of the science of the subject, a greater knowledge of the laws which govern the matter, for what is known at present is undoubtedly ill-defined.

The laws seem to be much the same as those which govern the human population, and the results of over-fishing what might be expected if "over-fishing" of human beings could be carried on in the same way. If the adults are removed by "over-fishing" the relative numbers of the adults decrease; and if the fishery continues to remove an equal number, the catch becomes a constantly greater proportion of the total left, thus heightening the rate of decrease. But if the young are not produced because of defective spawning conditions—which can not be blamed on the fishery—then the young are less numerous as compared to the undiminished numbers of adults until the latter have lived out their term of life. Decreased abundance of fish because of "over-fishing" of the older classes is therefore marked by decreased numbers of the older fish as compared to the young, while the reverse is true in the case of a natural decrease because of the failure of the young to appear. The inference is obvious, a record of the relative numbers of adult and young must be kept in connection with a record of the total abundance, and from it can be ascertained just where the loss in abundance occurred, the degree to which the fishery is responsible being to a great extent obvious therefrom.

If the failure of a spawning season could be ascertained early enough, it would provide a knowledge of the impending change. The value of such knowledge may well be illustrated by the history of the herring in Europe. It is well known that from the dawn of history great natural fluctuations in its abundance have occurred, according to which a great industry has been built up or destroyed, carrying with it the fate of whole towns. Recent studies by scientists in the Norwegian fisheries service seem to show that it is possible to forecast the magnitude of

TABLE 1.

Table* Showing Percentage of Each Age in the Catch of Norwegian Fat-herrings in Various Years, Illustrating the Appearance of an Unusually Abundant Class as Successive Ages in the Catch of Successive Years.

Catch	Age when taken							
	1 year, per cent.	2 years, per cent.	3 years, per cent.	4 years, per cent.	5 years, per cent.	6 years, per cent.	7 years, per cent.	Total, per cent.
During 1907	11.5	36.8	**51.3**	0.4				100.0
During 1908	0.4	51.4	10.3	**37.8**				99.9
During 1909	3.1	**61.0**	13.3	5.0	**16.9**	0.7	0 2	100.2
During 1910	0.2	50.7	**42.0**	0.9	1.7	**4.5**	0.1	100.1

*Note.—From Hjort and Lea, "Some Results of the International Herring Investigations," 1907-1911.

the yield according to the sizes of fish taken. A great drop in the abundance of the herring was apparently preceded by the failure of the youngest classes to appear in adequate numbers,—in other words a predominance of mature existed at the same time as a decrease in catch. The success of the commercial fishery for herring during a number of years, in fact, seems to have depended on the success of a single year's spawning, the product of which became larger and older every year but which was not supplemented by young produced by subsequent spawnings. The result was the lack of small fish until another successful spawning could occur. The consequence of the gradual natural disappearance of the old fish in such a case, without another class of small to take their place, may be easily imagined. If fluctuations of such magnitude as occurred in the herring fishery could be foretold, the doing so would be a truly great accomplishment for the good of humanity.

Yet such a service would not be comparable to that of showing that a species as a whole is in danger, that man's operations are incurring a preventable catastrophe. Depletion from over-fishing is, obviously, very likely to be confused with natural decreases due to things other than over-fishing, or man's demand for food. The ability, then, to distinguish natural fluctuations due to the spawning seasons for instance, should enable us to recognize the results of over-fishing with greater clearness. This is without doubt the most important service to be rendered by a study of the fluctuations.

So we must observe the classes of various aged fish as early as possible, distinguishing them with the greatest possible exactness, in order that the nature of a change in abundance may be known, whether caused by natural fluctuations or by over-fishing. How far this is from realization in all of our species is a striking testimonial to the indifference of man.

To do these things we must know the ages of the fish taken. We must be able to contrast two-year-old fish with those six years old, to recognize the youngest fish, and to be able to tell in what year any individual or class of individuals was born. If we do not know the year of birth we can not trace back the failure of the spawning season to the occurrence of any particular phenomenon or group of phenomena. This means the discovery of the age of the fish, not merely of a particular class, but of the individual, a subject difficult in itself.

We may illustrate the most obvious method of finding the age by comparing the fish on a given bank to an orchard planted at different times. There will be some variation, but trees planted in a given year will approach the same height, and the heights for the successive years will be very different. So if all the trees planted in each year were grouped, we might have well-defined size groups, and anyone looking at them would say, here is the one-year group, here the second, and so forth. And so it is with the fish; they arrange themselves in natural groups, according to the age. But when they become very old, the growth both of the trees and of the fish slackens, so that the difference between those born in different years becomes less than the difference between individuals, and the age can not be told.

But this is a cumbrous method. It could be carried out once in each case, to corroborate other methods, and then abandoned, as has usually

been done. A preferable method is to use the marks left on the hard parts of the fish, just as it is possible to use the rings left in the wood of the tree.

The reason for these marks is thought to exist in the nature of the growth of the fish. Its surroundings govern its growth, just as its temperature depends entirely on the temperature of the water. The seasons modify profoundly all the conditions of its surroundings, and with them the growth of the fish. During the winter months, growth and activity become much decreased, somewhat as those of a lizard or snake do. The tree grows by adding to its trunk a thin layer of woody tissue, and the part laid down during the colder months of the growing

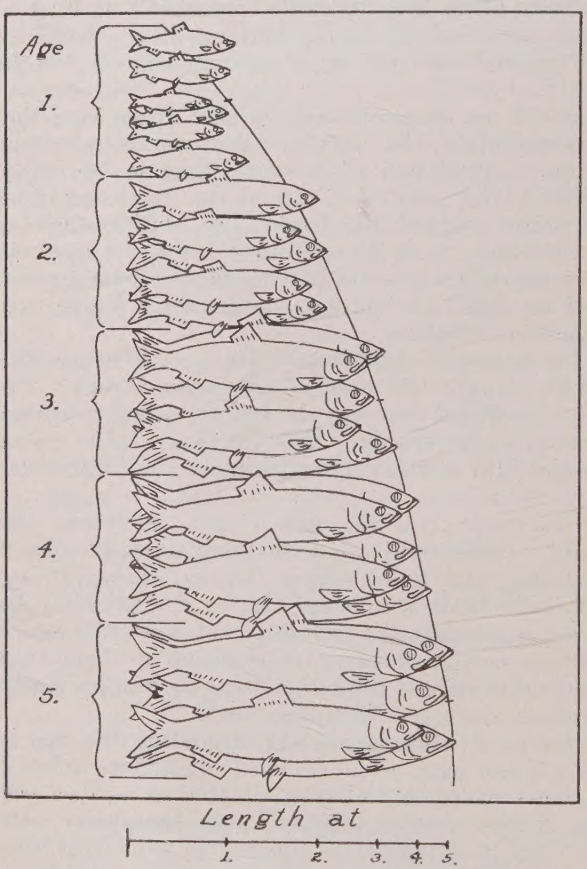


Fig. 19. Groups of fish of various ages, showing distinct difference in size between the early age groups, and the difficulty of distinguishing older ages by size alone. Average length of each group shown on line below, indicating the decreasing rate of growth with age.

season differs radically in structure from that laid down during the warmer. And so it is, presumably, with the fish and its hard parts, such as the scales, the otoliths or ear bones, and the bones of the body and head, although to be sure we can not attribute all the changes to the one condition, temperature, directly. The growth is by addition, leaving behind the old structure to tell the tale of the seasons that are past. Forest trees may tell of fires that have passed their way, of cold years, of warm years, of crowding by other trees, and of all the tragedies of the forest. So in a measure do the scales of the fish tell of birth, of years of plenty and of scarcity, sometimes of spawning, of injury, and

of migration, but through it all there is the tale of the seasons, the fundamental rhythm of existence among the lower animals.

We find that a scale is made up of many small rings, or circuli, but that at certain regions these are closer together, or that there is a mark or break in the continuity of the pattern on the scale. These parts which are thus marked are those in which the growth was affected, or even stopped. So there is a mark on the scale of the fish when it reached its first winter; and what was added during its second and its third summers, is clearly separated by other winter marks. We find that when we read the ages by these scales, the individuals in each of the size groups mentioned above and compared with trees in an orchard, are of the same age, and that the first size group has one annual ring, the second two and so forth, showing that the reading from the scales

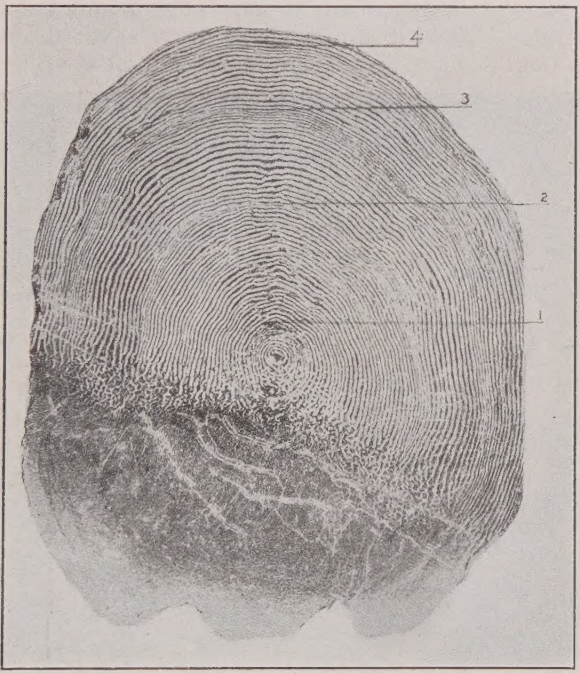


Fig. 20. Scale of Frazer River sockeye salmon, Bellingham, Washington, June 18, 1917, from female, 23 inches long, in fifth year, showing approximated circuli marking the winter growth, the end of which is indicated by a line in each case. (After Gilbert, Rept. British Columbia Commissioner Fisheries, 1917.)

corresponds with the size groups and hence must be accurate. Such a comparison has not been carried out in all species, but in a sufficient number to place the facts on a firm basis.

The same is true of the otolith. It is a calcareous formation in the ear of the fish, which grows by successive concretions. The ear of the fish is not visible from the outside, but is nevertheless well developed, with semicircular canals much like those of men, and in one of the sac-like parts is deposited the otolith. The portions formed during the winters have much less organic matter in them than the layers formed during the summers, and hence are easily distinguishable.

Thus we may know the age of the fish, and know when it spawns, how old it becomes before it dies, and we may know these things regarding each individual. This renders it possible to know in what year fish belonging to an abundant year class were spawned, and under what conditions they were born; therefore, why they were abundant. Without a knowledge of this kind, which would indicate when the results of particular phenomena might be expected to become evident, it is obvious that the careful study of such phenomena is meaningless from the standpoint of the fisheries. The age reading also renders it possible to accurately compare the numbers of fish of various ages, something we could not otherwise do, because if we relied on size groups we would confuse the ten-year-old fish with those nine and eleven years, or even eight and twelve years old. But aside from these more important things, there are, naturally, many things upon which a knowledge of the age throws light. Thus it is possible to prove that fish grow faster in one locality than in another. There is, indeed, much to be worked out,

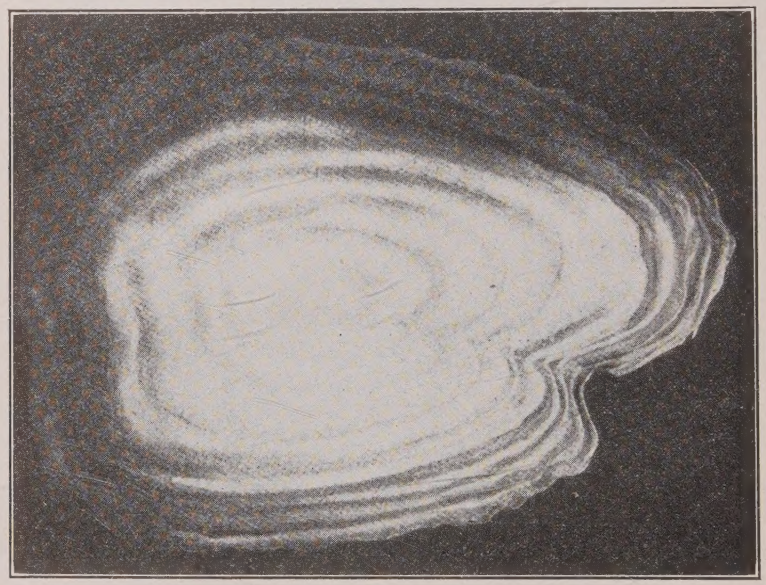


Fig. 21. Otolith, or ear bone, of halibut, in tenth year, showing dark "winter" zones and white "summer" zones. (After Thompson, Seventh Annual Report, Commission of Conservation, Canada.)

and much to be proved in the case of the individual species, and even in regard to the general principles governing the different species.

In every species the light thrown by a knowledge of age, even when most brightly, is dependent for its importance on a knowledge of whether it is shown for the whole of a species or for merely a small part which may happen to be involved by the fishery. We must know whether the locality is representative, or whether it is isolated from the others. Perhaps we could catch all the fish in one locality and the numbers of fish in other localities would not diminish, there being therefore no danger to the species as a whole. Similarly, the value of protection to a limited area is subject to the same considerations. But, it may well be asked, how is it possible to discover this isolation, when we can not

see below the surface of the waters to watch the coming and going of the fish? It is difficult, but possible, as we shall see.

We know that when a village of men is isolated, and the inhabitants interbreed for a sufficiently long time, a dialect grows up, and ultimately certain physical characteristics seem to mark the inhabitants. The formation of the dialect is a rough measure of the degree of isolation of the group. So it is with a school of fish, or those inhabiting a certain region, their separation from others leads in time to the formation of small peculiarities of habits and structure. If the separation is simply lifelong, perhaps only those characters will be changed which have to do with the amount of food obtained, such as the length of the head and the rate of growth. But if isolation is complete, and has lasted for many thousands of years, there are deeper, more fundamental differences, of habit and structure. These are indications of the degree of isolation.

TABLE 2.

Table Showing Difference in Number of Vertebrae Between Herring From British Columbia and California.*

Locality	Specimens counted	Average of count
British Columbia—		
Point Grey	160	51.8
Pender Harbor	96	51.8
Pender Harbor	281	51.75
Kildonan	305	51.8
Nanaimo	206	51.8
California—		
San Francisco	81	50.7

*From Thompson, "A Contribution to the Life History of the Pacific Herring," Report British Columbia Commissioner of Fisheries, 1916.

Therefore, it has become a well-recognized method of research, to take samples of fish from different regions and to compare them carefully by minute measurements, such as the length of the head, the shape of the skull, and the number of fin rays. The results are sometimes astonishing, for well-recognizable groups may be made out in many species of fish. The implication is always that there is no migration between the groups, that each group has its home waters, to which it is confined, or that it has well-defined habits which keep the stocks separate.

Another method used is to place on the fish silver tags, piercing the fins or the body for the purpose, and then to release the marked individual alive, with the hope of retaking it, or of having a fisherman return it. By keeping a record of where and when the fish was released, it is possible to discover how far it has traveled and at what rate. The trouble, naturally enough, is that the fish, because of the irritation, may travel farther and faster than it ever would naturally, and may perhaps leave "home" when it would not under usual conditions.

Sometimes advantage is taken of the fact that fish from a certain locality may be characterized by marks left on the scales by some local condition. Then the dispersal of the marked group may be traced from

year to year. An attempt has been made to use this method in the case of the herring, and also in the case of the sockeye salmon, where the scales are marked by the character of the growth during the first year or two. In the latter this has led to the identification of the birthplaces.

There are also other methods used of discovering the rate of movement, but none as valid. Thus when fish are abundant in one locality during one season, and abundant in another during the season following, migration is naturally supposed, by many people, to have occurred. In an extreme case of the use of this method, mackerel being abundant in Europe while they were not in American waters, many men drew the conclusion that the mackerel had migrated across the Atlantic. But there was no evidence to show that the disappearances and appearances were not simply the result of great fluctuations in the success of the spawning seasons. The dangers of such conclusions should be obvious, particularly when the imperfection of any known measure of the real abundance of the fish, such as the returns from particular methods of fishing commercially, is known. There were also at one time theories that the herring of European waters lived around the North Pole, and that they came down from the Arctic seas in great armies, the German *Heere*. These armies, or schools, were supposed to move around England and return to the far north. Now it has been proved that the herring of the Baltic, of the English Channel, of Iceland, and other localities, are of separate stocks which intermingle but slightly, if at all, and that they do not migrate in any such fashion. The method used to discover the truth was that which has just been mentioned of measuring the physical characteristics.

On the whole the tendency is to discredit migrations of great extent, but there are several marvelous migrations well known. Certainly the eel, which lives in fresh water, goes into mid-ocean to spawn. And just as certainly the salmon of the Pacific comes in out of the sea and passes up rivers thousands of miles long to spawn at the headwaters. But the quick assumption of long marine migrations, as that of the albacore into Mexican waters, is certainly to be deprecated. It is so easy to postulate complex migrations to explain varying appearances of fish in different localities in different seasons that to every species is ascribed such movements by the fishermen, with all the certainty in the world. But it is better, without doubt, to suspend judgment until actual facts from other sources are at hand to corroborate such theories.

It should be evident from what has been said that there is much to learn before over-fishing may be ascertained, or its extent judged. The problems to be met are large ones, yet not insuperable. The application of the acquired knowledge in order to prevent depletion is a considerable problem in itself. Over-fishing may always be stopped by restricting the fishery in any way, however crude and harmful the restriction may be, but the application of measures which will so distribute the restriction as to do the least harm to the fishery and the most good to the species is a different matter. Primarily, it is possible to restrain the fishery wherever it imposes its greatest drain on the supply, with a good chance of effectiveness; but that might not be the best available method. The most general principles underlying the subject are, as a matter of fact, unknown or undiscussed, despite the many legal measures passed by the legislatures.

We may ask, for instance, why the spawning season should be so persistently an object of protection. The eggs are slowly developed throughout the year, indeed throughout the life of the individual, and the death of a female in January certainly destroys as many eggs as its death in June, if the spawning season comes in June. The matter would seem to be one of securing the survival of an adequate number of individuals throughout their normal lifetimes, so that there would be enough of them to produce eggs. But that implies care that too many young are not taken, just as it implies care that too many adults are not taken. In short, the value of the individual at the various times of its life must be known, so that it may be used when it is of the least value to the species and of the most value to the fisherman. We are still far from such a knowledge of biology as that implies.

The impression that it is sought to convey throughout this paper is that in order to conserve our fisheries, there are many problems to be solved, all of them important. Among them that of the adoption of statistical methods having for their object the ascertainment of the abundance, rather than the amount taken, easily comes first. But such a substitution can not be made without a knowledge of biology to supplement and guide it. And the biological phases of fishery science are in themselves many and important, dealing as they do with the rate of growth and the movements of the fish. Then finally, there is almost no adequate knowledge concerning the methods of conservation, or the prevention of depletion. We are at the threshold of a period of exploitation of our fisheries and we must be sure that we begin an era of scientific investigation of our fisheries in time to adequately guide and control the exploitation.

The dependence of the statistical method and biological study upon each other necessitates their prosecution by an agency capable of giving the investigation its needed scope. Adequate statistics can be gathered by a government only, and the same is true of the biological data required. The responsibility therefore rests upon the state, in whose hands lies the legislative control of the fisheries.

THE BASSES AND BASS-LIKE FISHES OF CALIFORNIA.

Families Serranidae, Haemulidae, and Kyphosidae.

By EDWIN C. STARKS, Stanford University, California.

The basses are the most fish-like fishes, so to speak, for they represent more than others the typical spiny rayed fishes. They have been usually selected as types of fishes for books of anatomy and textbooks since the time the great French zoologist, Cuvier, so used the yellow perch early in the last century.

All of the families of bass-like fishes group about the central family, Serranidæ. They and the mackerel-like fishes apparently were descended from a common ancestor. Also related to the basses are the croakers, though less closely than any of the fishes here included.

It is not at all desirable to here discuss the technical characters that define these fishes. It is sufficient to say that the first dorsal fin is made up of spines, the ventrals are placed but little behind the pectorals and joined to the shoulder girdle internally, the anal fin is usually with three spines, the ventrals with one spine and five soft rays, and the scales

rough with little spinules on their margins. This last may be appreciated by passing the finger over the scales in the direction of the head.

Representatives of this group occur everywhere in fresh and salt water, except in the Arctic regions. They are very numerous in the tropics and often very brilliantly colored. Among them are some of the largest of bony fishes as well as some of the smallest, ranging downward from the giant sea basses to the pigmy sun fishes and darters, some of which are fully grown at a length of between one and two inches.

KEY TO THE BASSES AND BASS-LIKE FISHES OF CALIFORNIA.

1. The vomer with teeth. A small portion of the upper edge only of the maxillary hidden by the bones just above it (preorbital bones) when the mouth is closed.
   2. Side of body with well-marked lengthwise stripes. *Striped bass. Roccus lineatus.* Page 62.
   2–2. Side of body without well-marked stripes.
      3. Spines of first dorsal shorter than rays of second. The two dorsals not much united. Size very large. *Black sea bass or Jewfish. Stereolepis gigas.* Page 62.
      3–3. Longest spines of first dorsal as long or longer than the rays of second. The dorsals broadly united. Size not excessively large.
         4. No small round spots on head or body. The third dorsal spine not over twice as long as the second and a little shorter than the fourth. The preorbital bone at its narrowest part scarcely over half as wide as the diameter of the eye. *Rock Bass or Sand Bass, Paralabrax clathratus.* Page 66.
         4–4 Numerous small round spots scattered over the head, or head and body. The third dorsal spine at least three times as long as the second, and longer than the fourth. Narrowest part of preorbital about as wide as eye.
            5. The small round spots confined to the side of the head, and usually some are on side of tail just in front of the caudal fin. *Johnny Verde or Kelp Bass, Paralabrax nebulifer.* Page 68.
            5–5. The small round spots scattered over the head and almost the entire body and fins. *Spotted Kelp Bass or Cabrilla, Paralabrax maculatofesciatus.* Page 67.

1–1. The vomer without teeth. A considerable part of maxillary slipping under bones just above it, when mouth is closed.
   6. Pectoral fin pointed and reaching past tips of ventrals.
      7. A dark band extending downward from middle of spinous dorsal. Base of pectoral black. Third anal spine shorter than second. *Sargo, Anisotremus davidsoni.* Page 63.
      7 7. No dark band downward across body, but several dark stripes running lengthwise on body. Third anal spine longer than second. *Big-Eyed Bass, Xenistius californiensis.* Page 64.
   6–6. Pectoral fin rounded and not reaching past tips of ventrals.
      8. No scales on gill cover behind preoperculum. Each tooth divided into three points. Dorsal and anal rounded in outline. *Greenfish or Opal Eye, Girella nigricans.* Page 65.
      8–8. Gill cover fully scaled. Teeth single pointed. Dorsal and anal rising to an angle in front, straight edged or slightly concave along tips of rays when fin is spread, and sharp pointed behind as tip of last ray. *Half-Moon Fish. Medialuna californiensis.* Page 66.

GLOSSARY.

Anal fin: The unpaired fin along the lower side of the body.

Caudal fin: The tail fin.

Dorsal fin: The fin along the back. Sometimes separated into a first and second dorsal, the first part, whether separated or not, composed of spines in these fishes.

Fin rays: The softer elements that stiffen the fins. Differing from spines in not being sharp. They are usually branched like those that make up the second dorsal in these fishes.

Fin spines: Stiffer than rays, sharp at the tip and unbranched.

Head: The head is measured from the tip of the snout along its side to the edge of the gill cover.

Lateral line: A line of pore bearing scales along the side of the body. In these fishes it is more or less arched upward and follows the outline of the back.

Maxillary: The flattened bone just above the mouth and just above and behind the premaxillary.

Opercle: The gill cover just behind the preopercle.

Pectoral fins or *pectorals*: The fins just behind the gill openings, one on each side of the body.

Premaxillary: The bone bordering the upper jaw that bears the teeth.

Preopercle: The bone just behind the cheek that forms a ridge downward across the gill cover and turns at an angle forward.

Preorbital: The bone just in front and below the eye. It reaches downward to the maxillary and its surface is covered with thin membrane.

Snout: That part of the head in front of the eyes.

Ventral fins or *ventrals*: The pair of fins on the lower side of the body under the pectorals.

Vomer: A single unpaired bone that lies in the roof of the mouth directly behind the middle of the upper jaw. Do not mistake the palatines for it. They lie one at each side of the vomer parallel with the side of the jaw, and may or may not bear teeth.

FAMILY SERRANIDÆ.

The Striped Bass (Roccus lineatus).

This well-marked fish may be at once known by the dark horizontal stripes on the body, teeth on the vomer, a spine at the angle of the gill cover, and the pectoral fins not longer than the ventrals and not reaching

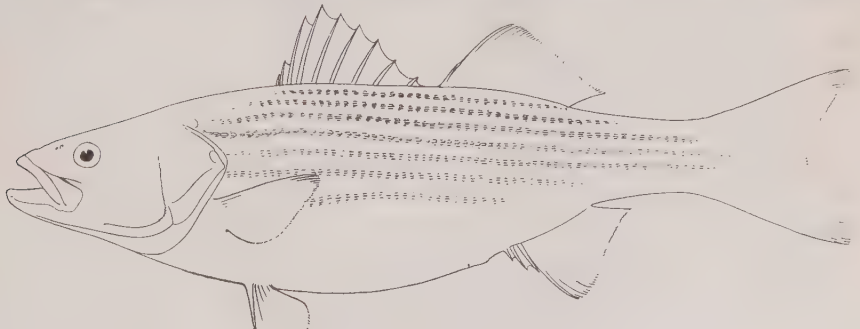


Fig. 22. Striped bass (*Roccus lineatus*).

so far back. There is another fish on our coast that has such stripes, but they are not so well marked and it lacks the above combination of characters. The eye is three or four times wider than the narrowest

part of the preorbital just below it. The maxillary reaches to below the middle of the eye. The mouth is armed with rather fine sharp teeth. Scales extend on top of the head to in front of the eyes. The edge of the preopercle is divided into many small sharp spines. The dorsal fins are separate from each other and about equal in height. The second dorsal and anal have a sharp angle at the tips of the first rays. The middle caudal rays are shorter, making the outline of the fin concave.

The color is silvery with brassy and coppery reflections, and marked with seven or eight blackish stripes, one of which is along the lateral line.

The striped bass, though not a native member of our coast, is one of our important food fishes. It was introduced from the Atlantic coast and has become abundant. It is caught to the limit of safety to the species, and being a much advertised fish it commands a high price. Though it is without question a very fine food fish, it is rather overrated. This fish reaches a weight of 80 or 90 pounds, and one was once reported on the Atlantic coast that weighed 112 pounds.

The Black Sea Bass or Jewfish (Stereolepis gigas).

This gigantic fish may usually be known by its size. The body is broad and robust, and covered with rather small scales. The top of the head between the eyes is wide and not very convex. The eyes are small, several times shorter than the length of the snout or the space between them. In small ones the edge of the preopercle is divided into spines, but the edge becomes nearly entire in large ones. Fine teeth are in broad bands on the jaws. The dorsal fins are separate, and the first one is composed of short, stout spines that are shorter than the rays of the second dorsal. The pectorals are rather round in outline, and reach past the tips of the ventrals. It is very dark brown or nearly black in color.

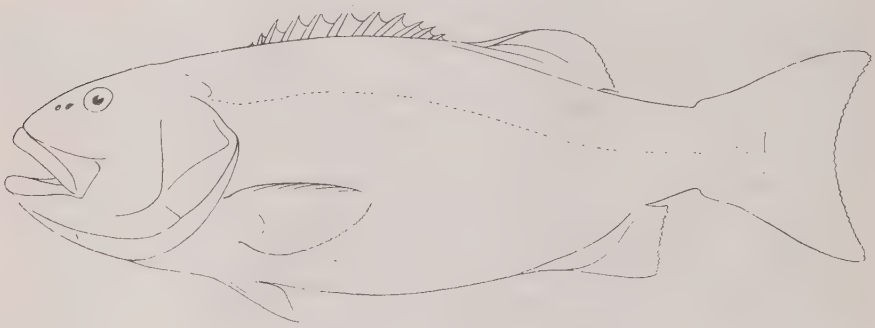


Fig. 23. Black sea bass or jew fish (*Stereolepsis gigas*).

This huge fish is rather abundant in southern California, and it is taken as far north as the Farallone Islands. It reaches a length of six feet, or sometimes even more, and a weight of 500 or 600 pounds. A considerable amount of its flesh, cut in large chunks and salted, finds a ready market. Its flesh, however, is not of the best, being rather coarse grained. Those of small or moderate size are said to be better than the large ones. It is a famous fish among the anglers of big game fishes, and monsters of nearly 500 pounds have been taken on tackle unbelievably light. Related to it is a huge jewfish of the south Pacific that is said to reach a length of 12 feet.

The accompanying drawing is a composite reconstructed from several photographs, all of which show the fishes hung by the lower jaw and the head much distorted. The photographs show considerable variation in the depth of the body as compared with the length, and a marked variation in the relationship of the anal fin below the soft dorsal. In some the two fins end evenly behind. In others the anal projects much farther backwards.

Rock Bass or Sand Bass (Paralabrax clathratus).

As in the other members of this family the vomer is rough with small teeth, and the hind part of the upper edge of the maxillary is but little hidden under the preorbital bone just above it. The third dorsal spine is about twice as long as the second and scarcely as long as the fourth. The eye is twice as wide as the bony part of the preorbital space just below it. Small, fine spines are on the edge of the preopercle bone, and a flattened spine is just in front of the soft flap at the edge of the gill cover. It is steel-gray below with the upper part of the side mottled and barred with broad blotches of dark color with silvery gray between. The fins are all tinged with yellow. There are no small, round, dark spots on the head or body. Fig. 24.

Fig. 24. Rock bass or sand bass (*Paralabrax clathratus*).

This bass is an excellent food fish. It reaches a length of 19 or 20 inches and a weight of 5 pounds. It is found from San Francisco southward along the Lower California coast, and is most abundant below the Santa Barbara Channel. This and the other two species of *Paralabrax* are all known as rock bass, kelp bass, and cabrilla without distinguishing between them. I have more or less arbitrarily restricted the use of these names in the hope that the species may be more consistently distinguished from each other by common names.

Kelp Bass or Johnny Verde (Paralabrax nebulifer).

This bass may be known by the small, round, dark spots on the side of the head, particularly below and in front of the eye, and, usually, on the side of the tail just in front of the caudal fin. The teeth on the

vomer and the relative covering of the maxillary by the preorbital is as in the rock bass. The third dorsal spine is considerably more than twice as long as the second and is longer than the fourth. The eye is as wide as the bony part of the preorbital space just below it. The spines on the edge of the preopercle and the flat spine on the gill cover do not differ much from those of the rock bass. The small scales on top of the head extend forward to opposite the front of the eyes. The ground color is solid greenish to under the middle of the second dorsal, behind which the color of the back and side is irregularly broken with short wavy lines. The under parts of the body are pure white. On the front of the body are some traces of irregular dusky bands extending down and back. The first dorsal has a large dusky spot in front, and the anal fin is a bright slate-blue. The cheek and region below the eye are covered with small round golden or yellowish-brown spots. Fig. 25.

Fig. 25. Johnny Verde or kelp bass (*Paralabrax nebulifer*).

This bass is a very good food fish, differing little in this respect from the rock bass and spotted kelp bass. It is rather abundant on the coast of southern California, and has been occasionally taken as far north as Monterey Bay, while southward it extends its range along Lower California. It reaches a length of about 18 inches.

Spotted Kelp Bass or Cabrilla (Paralabrax maculatofasciatus.)

The spotted bass may be at once known by the small spots that everywhere cover the head and body and extend over the second dorsal and caudal fins. In common with the other members of the family Serranidæ the vomer is rough with fine teeth and the maxillary is only slightly hidden by the bones above it. It resembles the kelp bass (*P. nebulifer*) and differs from the rock bass (*P. clathratus*) in having the third dorsal spine longer than the fourth, and the eye as wide as the preorbital space below it. It differs from the kelp bass in color, and in having the fine scales on top of the head not extending forward beyond the middle of the eyes. The color is greenish-brown covered over with small, round, dark brown spots very close together. These extend onto the soft dorsal, caudal and anal fins. On the side of the head the spots are smaller and tinged with golden color. Six or seven dusky bars extend down from the back across the body. On these the

spots are darker and more or less run together. A dusky-bluish streak extends from the eye down and back across the cheek. Fig. 26.

This is one of the very few shore fishes found on our coast that extends its range southward as far as Mazatlan, Mexico. It has not been reported north of the Santa Barbara Channel. It reaches a length of 18 inches and as a food fish ranks with the other two basses of the genus *Paralabrax.*

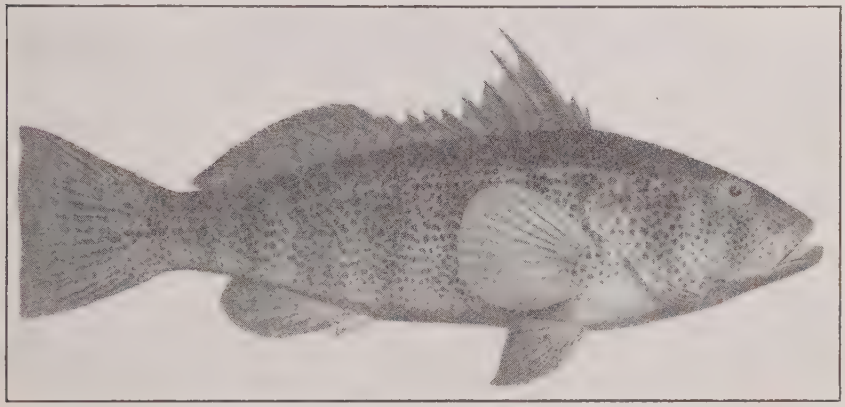


Fig. 26. Spotted kelp bass or cabrilla (*Paralabrax maculatofasciatus*).

FAMILY HÆMULIDÆ.

Sargo (Anisotremus davidsoni).

The sargo is a deep bodied fish that may be at once known by the dark band that extends down across the body, and the dark spot on and above the pectoral base. The mouth is small, slightly sloping from the horizontal, armed with fine teeth set in bands, and with thick, fleshy lips. When the mouth is closed the lower jaw scarcely projects beyond the upper. The maxillary, which is considerably covered by the bones above it, scarcely reaches back to under the front of the eye. The edge of the preopercle is armed with small spines. The base of the spinous dorsal is longer than the second dorsal. The dorsals are connected, and the longest spines are longer than the longest rays. The base of the anal is short, or scarcely equal to more than half the distance from the anal to the base of the ventral spine. The caudal is somewhat forked, or deeply concave behind. The pectoral is long and pointed, about as long as the head and reaching well past the tips of the ventrals. Color grayish-silvery, dark above with many dark points. A black cross-band extends down from the middle of the spinous dorsal across the side to a point on a level with the pectoral base. The base of the pectoral is black, with the black extending some distance upwards and touching the edge of the gill cover.

This fish ranges from San Pedro southward along the Lower California coast. In the summer time it is reported to be not uncommon about San Diego and the Santa Barbara Islands. It reaches a length of somewhat over a foot.

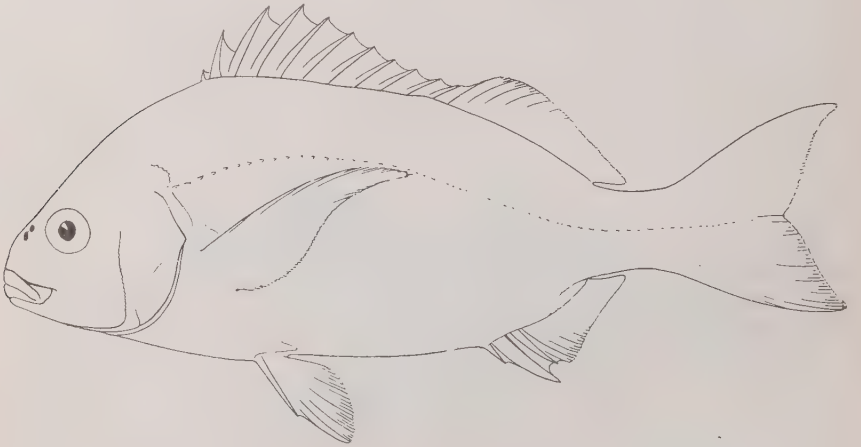


Fig. 27. Sargo (*Anisotremus davidsoni*).

Big-eyed Bass (Xenistius californiensis).

This is not a true bass, but belongs to the related family Hæmulidæ. It has no teeth on the vomer, and a considerable portion of the maxillary is covered by the bones just above it. It somewhat resembles the striped bass in the shape of the fins and in having stripes lengthwise of the body, but the stripes are not nearly so conspicuous. The eye is very large; its diameter greater than the space between the eyes on top of the head, and about equal to the distance from its front margin to the tip of the lower jaw when the mouth is closed. The mouth is moderate in size, very oblique, and with the lower jaw projecting beyond it in front. There is no flat spine pointing backwards at the hind angle of the gill cover. The maxillary reaches to opposite the front of the large

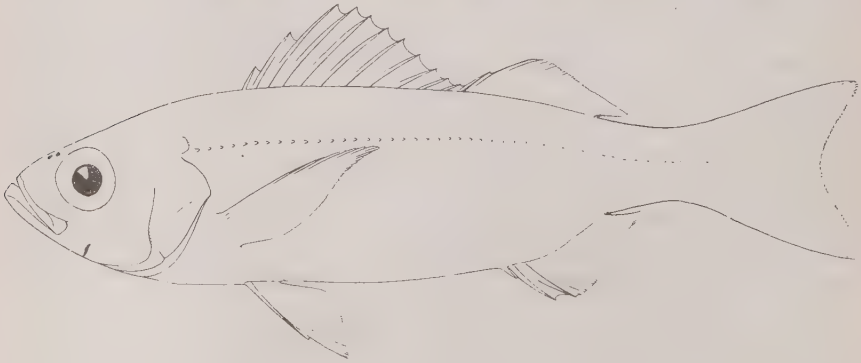


Fig. 28. Big-eyed bass (*Xenistius californiensis*).

pupil. Fine spines are around the edge of the preopercle. The pectoral is pointed and extends farther back than the ventral fins. The first dorsal is rather triangular in shape, almost separated from the second dorsal, and is composed of rather stiff spines. The second dorsal resembles the anal fin. The scales feel very rough when the finger is passed over them in the direction of the head. The color is bright silvery, bluish above. Six or seven dark orange-brown stripes run lengthwise of the body.

The big-eyed bass reaches a length of about a foot, and is found from southern California southward along the Lower California coast. It is reported to be sometimes common about San Diego.

FAMILY KYPHOSIDÆ.

Greenfish or Opal Eye (Girella nigricans).

The greenfish has a bluntly rounded head and a moderately deep body. Small teeth are in bands on the jaws, attached to the membrane only and freely movable. Examination with a magnifier will show that each tooth is divided into three points. The maxillary is entirely hidden under the bones above it, leaving only the premaxillary in sight when the mouth is closed. The maxillary scarcely reaches to below the front

Fig. 29. Greenfish or opal eye (*Girella nigricans*).

of the eye. The edge of the preopercle is not divided into fine spines, and behind it the gill cover is devoid of scales. The spinous dorsal is much longer than the soft dorsal and broadly attached to it. The spines do not decrease much in length towards the last ones, and the longest ones are about as long as the longest rays. The rays of the anal fin are about as long as the base of that fin. The pectoral is short and rounded, nearly as long as the head, and scarcely reaching as far back as the tips of the ventrals. The caudal fin is slightly concave. The color is olive-green, paler on lower parts, the fins dusky greenish. Small ones have a yellowish spot on the back, and the fins have bright blue borders. The blue color quickly fades when the fish dies. The eye is a beautiful opal blue and green, hence the name, opal eye, that is sometimes applied to it. It is also called bluefish and blue-eyed perch.

The former name should be discouraged as it is not related to the famous bluefish, and the latter is doubly unfortunate, for it is neither a perch nor related to the fishes on our coast that we wrongly call perches. The name was doubtless given it from a fancied resemblance to the false perches, but aside from the shape of the body, it has nothing in common with them.

Though the greenfish is herbivorous, feeding very largely on sea weed, it will bite a hook baited with a bit of clam or abalone. It scarcely exceeds a foot in length, and when fresh is a food fish of very good quality, but its flesh is rather soft and does not keep well. It is found in abundance from San Francisco southward to the coast of Lower California. Small ones are very abundant in tide pools.

Half Moon (Medialuna californiensis).

The half moon is a compressed deep bodied fish that may be known from its relatives on our coast by the complete covering of fine scales that extends over the anal and second dorsal fins, and to a less extent over the caudal. The mouth is small, slightly oblique, and armed with fine even teeth set in broad bands. The maxillary scarcely reaches back to below the front of the eye. The lower jaw scarcely projects

Fig. 30. Half moon (*Medialuna californiensis*).

beyond the upper when the mouth is closed. The edge of the preopercle is thin, membranous, and not divided into fine sharp points. The first dorsal is connected with the second and is very much lower, the longest spines being little longer than the diameter of the eye. The anal is shorter than the soft dorsal but resembles it in shape, being highest in front, where it rises to an angle and sharp pointed behind at the tip of the last ray. The caudal is evenly concave behind. The pectoral is rounded, much shorter than the head, and not reaching nearly so far back as the tips of the ventrals. The color is dark steely gray, lighter below, and more or less mottled, all of the fins are dark, and the dorsal and anal nearly black.

This fish is very beautiful in its lines and color. It is taken in considerable abundance about rocky places on the southern California coast, and is reported to be a very good pan fish. It reaches a length of about a foot.

BEAR HUNTING WITH BOWS AND ARROWS.

By SAXTON POPE.

For some years back a number of us in San Francisco have been hunting with the bow and arrow, purely for sport. A powerful bow is an effective weapon, but it takes months of practice to be able to shoot it well. Such a bow pulls 75 pounds.

Having killed rabbits, quail, squirrels, bobcats, skunks, foxes, and deer, we naturally wanted to try our hand on a bear. We knew that a bear is a hard animal to kill even with a gun, but we also knew that the Indians killed him with a bow. So we wanted to find out just how much there was to the game. Our friends of course were very skeptical. They said that an arrow would hardly go through his hide.

Fig. 31. Black bear killed with bows and arrows by Arthur Young and Saxton Pope of San Francisco in Panthen Canyon, Humboldt County, California.

We got in communication with Thomas Murphy of Blocksburg, Humboldt County, who hunts bear as a business. He has been at this sort of thing for thirty years and never fails to get about a dozen bear every winter. So we packed up our strongest bows and several dozen broadhead arrows, and Arthur Young and I went up to Blocksburg.

Murphy was willing to let us shoot at a bear, but he insisted upon carrying a gun in case of accidents. He said he didn't want to lose a valuable dog over the affair.

After four unsuccessful hunts, we at last treed a good-sized bear up a tall fir. After securing the dogs, Mr. Young and I took our stand about thirty yards from the base of the tree, on the sidehill, and let drive two arrows at one time. Both shafts struck the bear in the chest, going completely through, feathers and all.

Quick as a flash the bear wheeled about and began descending the tree. We ran up close and shot him again as he neared the ground, and bounded down the hill. Murphy turned the dogs loose, and they all went crashing through the brush together.

Pretty soon we heard them bay him again, and we rushed a quarter of a mile down the canyon to find him sitting on the limb of another fir, holding on like a man. We shot again and he dropped to the ground, where the dogs heeled him and went flying past hanging on to a hind leg. The bear immediately mounted a nearby oak, not over eight inches in diameter, and swung out on a limb. At close range, we shot arrow after arrow through his chest while he slipped further out on the bending limb, and at last fell to the ground, rolling over and over down the canyon. The dogs were on him in a second, and by the time we reached the creek bed, the bear was dead.

Murphy performed the autopsy, giving the hounds the liver and lights. Eleven arrows had gone through the beast, seven of these through the chest. The lungs were collapsed and pulmonary hemorrhage finished him. The first two shots would have been enough if we had waited.

It was a three-year old female black bear, weighing about 150 pounds. That it was no larger was no fault of ours. The arrows cut ribs in two at several points and undoubtedly could have penetrated any beast with a hide less resistant than a hippo or an elephant.

NOTES ON THE ARTIFICIAL PROPAGATION OF THE SPINY LOBSTER.

By P. S. BARNHART, Scripps Institution for Biological Research.

Because of its possible bearing on the future artificial propagation of the spiny lobster, *Panulirus interruptus*, I think it might be worth while to make a record of the conditions under which eggs were hatched and the young carried through the phyllosome stage of development.

It has always been easy to secure berried lobsters and obtain from them the first stage of the young. These have always died before passing through further stages of development, even though kept in fresh running sea water, supposedly under ideal conditions.

B. M. Allen working under the auspices of the California Fish and Game Commission in 1911, constructed elaborate hatching boxes at the inlet to False Bay, where a plentiful supply of fresh water was constantly available and the water in the boxes kept in constant agitation by means of a rotating wheel. In his published notes (1916) he says:

"There is no difficulty in securing the young. It is only necessary to impound spawn-bearing females. The young hatch very readily even after the spawn-bearing parent has been kept in captivity for weeks. Attempts to rear them, however, proved futile. Their extreme delicacy and pelagic habit make their culture an especially difficult problem."

On May 14, 1918, a berried lobster was placed in a large concrete tank, 6 by 9 feet, in the research aquarium of the Scripps Institution. This tank contained approximately 800 gallons of water. A small jet furnished about 5 gallons of water an hour. The 20th of June two green turtles weighing about 30 pounds each were placed in the same tank. Every few days after this quantities of a green alga was thrown in for the turtles to feed upon. Much of this rotted and accumulated in

one corner of the tank under and around a lot of large stones where the lobster kept itself hidden.

The in- and outflow from the tank was not enough to keep the water perfectely fresh and it began to take on the milkly hue indicative of bad water. This finally became so bad that I decided to clean the tank out. On the 10th of July I started to do this, but where the sun struck the water I noticed that there was a slight movement on the surface as of many small animals moving about. I immediately made a haul with a fine net and was much surprised to find quantities of phyllosomes. Many of these were put into fresh running water where they remained alive for several days, but gradually died off. Those remaining in the large tank kept alive about eight days when they also died. As far as I was able to observe these were in the small, first phyllosome stage.

This experiment might indicate that, while bearing and hatching the eggs, the adult seeks comparatively quiet water where there is much decaying vegetation. It surely proves that fresh clean water is not necessary for their hatching and development to the phyllosome stage. Allen found that spawn-bearing females usually "seek sheltered spots in the lea of islands or points of land and take refuge in sheltered crevices of rocks alongshore."

I hope to repeat this experiment this year on a much larger scale.

IS THE HERRING GULL INSECTIVOROUS?

By A. C. BURRILL, Idaho Station Entomologist's Office.

Some individuals doubt that gulls naturally eat insects. They consider that the blowflies reported eaten by gulls (Dr. Dutcher, President of National Association of Audubon Societies), were merely gulped down when some gull seized a beached fish on which the flies might have been ovipositing. This seems probable and also that some other insects eaten, as the white grub's adults, the May beetle, may have been washed up on shore alongside fish and so included with the bigger mouthful, even if the young gulls were being fed by their mothers at the time. (By the Wayside, Feb., 1912, p. 42.)

In The Auk (v. 19, p. 46), Doctor Dutcher saw at the No-Man's-Land Gull Reservation, Maine, young gulls which, as soon as able to leave the rookery, went in flocks to neighboring grass and potato fields and ate immense numbers of grasshoppers and potato beetles. This doesn't look like mere beach scavenging, does it? Yet I agree that many insects can be easily swallowed unintentionally by scavenging gulls. In the summer of 1910, I related in a recent note how the gulls cleaned up the fish driven ashore on Lake Michigan, Whitefish Bay, Wisconsin. At that time there were thousands of beetles, largely ladybirds (Coccinellids) of many kinds, along the beach, besides various other unfortunates, so that a gull would have great difficulty in cleaning a fish body of all of the smaller fry before swallowing.

Owing to the lack of material, former Chief Henshaw says, our Federal Biological Survey has made very few stomach analyses of this species. But just lately Dr. A. S. Alexander called to my attention a Scottish work (Transactions of the Highland and Agricultural Society of Scotland) in which in 1912 is given the analysis of 616 Scottish bird

stomachs, including 44 herring gulls (the same as ours, *Larus argentatus* Gmel.). This seems to accord so well with the little known here that I venture to quote in the words of the author, Miss Laura Florence, Carnegie Scholar in the University of Aberdeen, published at Edinburgh: "*Summary*: 15 contained fish; 3, carrion; 13, shells; 4, refuse; 1, brittle star; 4, crustacea; 3, insects of injurious group; 2, insects of indifferent group; 3, earthworms; 3, potatoes; 9, grain; 14, grass; 9, seeds." Again, she lists the food for a single male shot at Donmouth in Aberdeen, Oct. 31, 1910: "Stomach about quarter full: fragments and husks of grain; fragments of chitin; forceps of an earwig (Forficuliadæ); grass." The chitin mentioned may have been other parts of the same earwig or some other insect. This work was supervised by the well-known zoologists, Professors J. Arthur Thompson and J. W. H. Trail.

Fig. 32. Herring gulls on breeding grounds, No Man's Land, North Carolina. Photograph by Herbert A. Job.

Thirty per cent of these gulls, therefore, ate fish, but the amount of fish material must have been much less than that. Compare Mr. Henshaw's statement regarding American gulls: "The herring gull can be considered a fish eater only to a very limited extent. Occasionally, we have found the remains of fish in the stomach contents, but there has always been collateral evidence that the fish were eaten in the shape of offal. When about harbors and inland waters, its principal food consists of garbage. We have a number of stomachs collected in Maine by Dutcher, and these contain the remains of June bugs and other insects with about 10 per cent of fish garbage, showing that the herring gull is in some localities and to some extent, at least, insectivorous."

In Leslie's Weekly, for Sept. 5, 1912, there is a view of the American battleship "Utah," near Galveston, Texas, surrounded by sea gulls

picking up refuse. In an earlier issue, February, 1909, is another of gulls picking up fish from a school of herring on the high sea. This is more often true of the kittiwake gull or of the stormy petrel, alias "Mother Carey's Chicken," well shown in Collier's Weekly for Sept. 6, 1913 (p. 15), though Mabel Osgood Wright says the name herring gull was given this bird "because as they were originally fishermen by trade, their presence flying above the water told where schools of herring were to be found. Today the schools of herring are less plentiful along our shores, and the value of this gull, though greater than ever, is due to a different source." Now gulls act as scavengers, becoming "the health officers of the coast" (November, 1907, The Herring or Harbor Gull, Educ. Leaflet No. 29. The Nat. Ass. Aud. Soc., N. Y. City).

Mr. Brann (By the Wayside, January, 1912), claims gulls still dive for fish occasionally in Green Bay, Wisconsin, but Mr. Henshaw rather disputes this for the United States as a whole, and so writes friend W. T. Davis, a careful observer and naturalist of Staten Island, New York Harbor (letter, Dec. 31, 1912). One of the best refutations of much fish being eaten by gulls came out in the Pall Mall Gazette (Feb. 6, 1912), Mr. F. G. Aflalo saying:

Fig. 33. Sea gulls flying over headlands, La Valle, California. Photograph by L. Hugo.

"The public mind is constantly being misled on this subject of the destructiveness of gulls by journalists with a passion for statistics. Only the other day a morning paper published what purported to be the pictorial menu of a sea gull during the year. It was shown in terms of a great line of barrels of herrings, 146 barrels, each containing 500 herrings, to a total not far short of 200 pounds sterling. There were two very obvious fallacies in this reckoning. In the first place it assumed that the whole of the 73,000 herrings thus consumed as fry, would have grown to maturity if the gull had left them alone. To put it mildly, this is by no means proved; to put it frankly, it is rubbish.

Moreover, this imposing cartoon gave no hint of the tons of offal and garbage which, to the great benefit of many a harbor, these feathered scavengers consume every year. The picture told, in fact, what was not true, and suppressed what was."

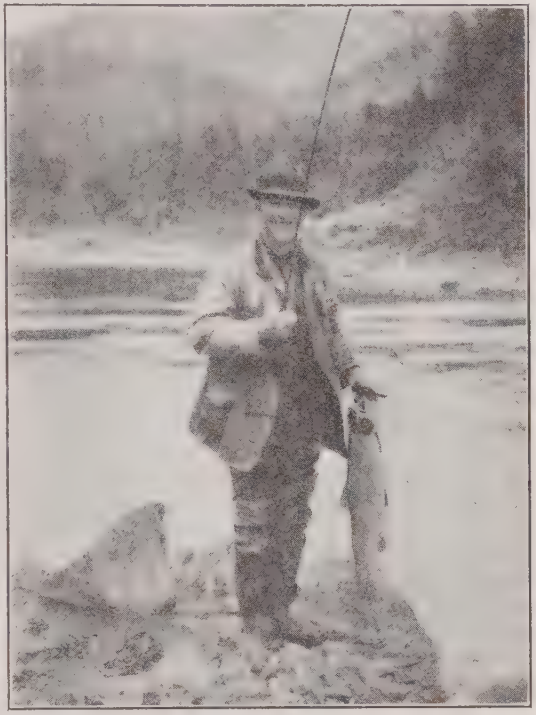
Mr. C. W. Creel, in charge of the cereal and forage insect investigations laboratory of the United States Bureau of Entomology, at Forest Grove, Oregon, informs that often, when the farmers are plowing in the Salt Lake Valley, Utah, gulls come in large flocks to work over the land, whether after insects or field rodents would be a very interesting line of investigation. Likewise we have a photograph of many gulls visiting plowed land in California, and suppose that this is the California gull. However, it will be interesting to hear from other observers, if the herring gull, which is less common there than in other parts of America and Europe, still shows sufficient interest in plowed fields in California to associate with the California gulls in their field patrols.

One species of gull flies up the Columbia River and has been reported in spring as far up the Snake River Canyon as Lewiston, Idaho, per Adjutant General Charles Moody, showing that even inland Idaho, though lacking large lakes, may be within the flying zone of this valuable species. In the Big Bend country of eastern Washington, some of the farmers who were worried by the large armies of coulee crickets in the spring of 1918, were discussing if there would be any advantage in shipping a few pairs of gulls to the desert country to eat up these crickets and thus attract more gulls to fly in from the coast, and thus repeat the well-known tale of the Mormons and the Mormon crickets of Utah, and the deliverance effected by the gulls. Further data is invited.

Messrs. B. G. Thompson and M. M. Reeher, special field agents of Mr. Creel's office, have furnished the following details. Mr. Thompson was sent into the grasshopper afflicted district near Burns, Harney County, Oregon, May, 1918, where he met a Mr. McGee who said that for several years gulls had been working on grasshoppers. Messrs. Thompson and McGee went out to look for a new band of hoppers in May and after a long hunt saw at a distance about a thousand gulls feeding on the land. Mr. McGee felt sure that they would find the hoppers near there, and on going over to see, found the gulls so gorged that they would hardly get out of the way. The gulls were busily picking up the young hoppers. Mr. Reeher was sent into Langells' Valley, near Klamath Falls, Oregon, early in June, 1918. His guide told him that a few gulls visited the hoppers the year before, and showed him this June, 1918, about five hundred gulls feeding on hoppers. We have no data as to what species of gull this was, save that it was white with bluish slate-colored wings, which answers to at least three species. As the California and ring-billed gulls breed in colonies on Klamath Lake, it seems reasonable to believe that birds of these two species were implicated.

These facts are given to show that gulls may be quite as well worth study in the West as in the East, and their protection quite as necessary.

FRANK A. SHEBLEY.



The death of Frank A. Shebley, one of the oldest employees of the Fish and Game Commission, which occurred in a hospital in Yreka, December 21, 1918, came as a profound shock to scores of friends. Although he had been unconscious for seven hours after the accident to the auto bus in which he was riding between Fort Jones and Yreka, several days before, on Saturday morning there was every indication that he would get well, but a sudden change which occurred late in the afternoon ended in death.

Frank Shebley was born in Nevada county nearly forty-seven years ago. He was the son of California's first famous fish culturist, and had succeeded before his death, in company with his brother, William H. Shebley, in making a reputation as great if not greater in the same line of endeavor than that of the father, who had gone before. As a boy, he followed farming on his father's place, but for the past twenty-five years has been identified exclusively with fish culture in connection with the California Fish and Game Commission, and there are few men on the Pacific slope who knew as much about fish and fishing in the waters of the rivers and bays as Frank Shebley knew. During his experience with the Commission he was the superintendent of the Price Creek hatchery in Humboldt county, and the Brookdale hatchery in Santa Cruz county, and recently the new Mount Whitney hatchery in Inyo county. Under his management the Brookdale hatchery became very popular and was sought out by sportsmen from all over California as a place of great interest. Also interested in angling as a sport, he was a master of the fly rod and a skilled angler. In recent years he had given some attention to land investments, as well as mining ventures, and with W. P. Netherton of Santa Cruz was the owner of considerable property in Texas.

Few employees of the Fish and Game Commission have been so universally loved as has Frank Shebley. His genial personality and perpetual good humor won for him hosts of friends. His loss will, therefore, be a personal one to many. Mr. Shebley's fish cultural attainments furnish assurance that the vacancy left by his death will be hard to fill.

CALIFORNIA FISH AND GAME

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

April 21, 1919.

"Conservation deals with those things to which practically every normal person turns for relaxation in his moments of leisure."

OUR MAILING LIST.

The mailing list for CALIFORNIA FISH AND GAME has been entirely revised. Those who did not take the trouble to sign the card enclosed in the October number have been removed from the list and a new written request alone will replace them.

There have been so many additions to our mailing list of late that the edition published has had to be increased. This, in connection with a marked increase in cost of printing, leads us to speculate as to the possibility of continuing free distribution. It may well be that some small charge will have to be made for the magazine in the future. If this change becomes necessary, we will but be following the lead of several other states. A regular subscription list would allow a great saving in postage in that the magazine could then be mailed as second-class matter.

PENDING LEGISLATION.

Less important fish and game legislation has come before the present legislature than for many years past. The bills that have been introduced are less radical in nature and notably less in number. The few relating to game which stand out as desirable are: A bill granting discretionary powers to the Fish and Game Commission which would allow better administration of fish and game resources; bills making the state laws conform with the new federal regulations; and one remodeling the districting act to include two new game refuges, an area in the vicinity of Mt. Breckenridge, Kern County, and an area on Mt. Hamilton, Santa Clara County.

Desirable changes in the law requiring fishways are provided for in two bills, and it is hoped that another bill prohibiting fishing within two hundred and fifty feet of any fishway or screen will be passed. An important bill provides for the inspection of all imported fish eggs or fish so that undesirables may be quarantined.

Among undesirable bills relating to game are those which provide bounties on predatory birds and on predatory mammals, one opening the bear season in districts 2, 2A and 10, one opening the season on rabbits in the above districts, one providing for the repeal of the hunting license law, and one providing for the sale of ducks killed when destroying rice. A bill to permit the use of a spear in taking trout in certain local districts and a pernicious shrimp bill are among those relating to fish which would tear down present protective laws.

It seems reasonable to believe that our legislators will look with disapproval on those bills which are adverse to the best interests of our fish and game, and will stand by those tending to uphold protection and conservation for our wild life resources.

FISH AND GAME COMMISSION INAUGURATES EDUCATIONAL WORK AT SUMMER RESORTS.

Believing that a better knowledge of wild life will bring about better conservation of it, and that when people are on their summer vacations they are most responsive to education on wild life resources, the California Fish and Game Commission, backed by the Nature Study League, will institute this coming summer a series of lectures and nature study field trips designed to stimulate interest in the proper conservation of natural resources. The Tahoe region has been selected for the work this year. The work will be offered at six different resorts. The month of July is the time set. All lectures and classes will be open

to the public and no fees will be charged. Illustrated lectures on the game birds, song birds, mammals and fish will furnish evening entertainment, and early morning trips afield will give vacationists an introduction to mountain wild life.

Everyone wants to recognize the plants and wild things encountered on the summer vacation. There is no better way of developing this ability than to accompany one who knows the trees, birds and mammals. Special attention will be given the identification of birds by call, song, color and habits. The motto of these classes will be: "Learn to read a roadside as one reads a book." Knowledge of wild life insures better conservation of it. Special excursions for children will be conducted.

These nature study lectures and field trips which compose the vacation camp work of the Bureau of Education, Publicity, and Research of the California Fish and Game Commission are designed to bring about a healthy interest in the out-of-doors and in wild things that through knowledge proper public sentiment and proper conservation of our natural resources may be brought about. In other words, "conservation through education" is the end being sought.

PRESERVE GAME RESOURCES.

California's natural resources in fish and game, with its incomparable climate, its 26,212 miles of fishing streams, its 862,000 acres of lakes and every stage of climatic conditions to be found out of doors, are a gigantic magnet drawing people from remote corners of the earth. California should be the mecca for the human race. The remarkable development of road building of the past few years, with the development of the automobile, have brought the people in touch with this wonderful fish and game asset.

To hunt and fish is as natural to the California boy and girl as to breathe. The farmer and land owner is practically the breeder and raiser of our game and he is ever zealous in its protection. His children hunt and fish whenever the season and opportunity offer. Not a family exists in our rural districts that does not own, as a family heirloom, a shotgun or a rifle, and both sexes of the children are taught their use. They can teach many an expert the fine art of angling in the stream that flows by his home.

There in the rural districts you will find the nucleus of the strong, virile generation that Northern Europe knows so well and that will come after us, for they live much in the open, where they learn self-reliance. Let us not remove from them the natural opportunity to improve their physical being, but rather assist them by conserving our natural resources in fish and game.

Continued changing and revising the fish and game laws will do more toward decimating our fish and game than all the hunters and fishermen can possibly do. The State Fish and Game Commission is a state body directing and supervising the entire work of fish and game protection, propagation, distribution and conservation. Thus the state is administered as a unit and a maximum degree of protection can be given. This could not become an actual possibility were each of the fifty-eight counties given full and complete control within their respective borders. With fifty-eight separate and distinct districts, ranging from a mere handful of population to half a million, each endeavoring to handle the affairs of each for themselves and not one for the other, one can easily imagine the chaotic state of affairs that would result. Thus one can realize why experimental legislation would be and is more detrimental to the unsurpassed fish and game interests of California than all her hunters and fishermen, alien and domestic.—Editorial, Sacramento *Union*, Feb. 16, 1919.

LARGE PROFITS WITH SLIGHT OUTLAY.

Few, if any, natural resources of a state are administered with so slight a cost to taxpayers as is fish and game. Wild birds, mammals and fish yield a splendid annual return in food and sport, to say nothing of their help in controlling pests, and this wild life does not need food or shelter, but simply reasonable protection. Not one dollar is appropriated by the state for its maintenance. The small burden falls entirely upon those who make most use of the resource. The hunters and anglers of this state by paying a small license fee of $1.00 furnish

the funds used to enforce fish and game laws and initiate protective measures. Many persons are ignorant of these facts and these are the ones that continually complain of the high cost of fish and game administration.

"NOW BEGINS THE SEASON."

"Now begins the season of the year when the weary city man turns his face from the familiar crowds and noises of the city to the country places: where he may fish in the trout streams; plod over the hills with a gun on his shoulder in the hope of shooting something; dabble in the ocean waves at the beaches; or sleep all night on the hard ground, with queer noises going on in the woods around him, curious little insects walking over his body and tickling him, curious little animals tiptoeing around among the leaves, and unknown dangers, remembered from his primitive days, waiting to catch him and gobble him up."—San Francisco *Bulletin*, June 30, 1914.

It is good for a man to wander back at intervals into the domain of old Dame Nature. What good does it do? It means quickened pulse, hearty appetite, an inexpressible tingle of exhilaration in every nerve, better poise, greater resiliency of step, augmented power of body and mind for the battles of the workaday world.

What element is more important in making insistent the call to marsh, field, and mountain than that furnished by the wild life? Exterminate the game and you make the world drearier, more monotonous, less interesting. Exterminate California's game and you turn one of the most attractive of the sisterhood of states into a desolate waste.—*Western Wild Life Call*, No. 4.

CONVICTION MADE UNDER FEDERAL MIGRATORY BIRD TREATY ACT.

Los Banos and other San Joaquin points have heretofore supplied most of the ducks for the market. Changed conditions have moved the activities of market hunters to Colusa, Sutter and Yuba counties. The city of Colusa, being in the center of operations, became the rendezvous of most of the market hunters. The fact that the Migratory Bird Treaty Act prohibits the sale of all waterfowl made no difference to these men who shoot for money.

The difficulty of detecting sale transactions is evidenced by the following facts: One of the most notorious hunters maintained a joint in Colusa where ducks were dispensed after the password had been given. So notorious had the place become for the distribution of ducks that traveling men had no difficulty in purchasing them at any time. It was the custom of these men to keep a supply of ducks on hand in order that they might guarantee the limit to so-called city "sportsmen" whom these hunters took out at so much per day. The surplus ducks were shipped to San Francisco and Sacramento under fictitious names to be distributed by agents.

The proprietor of this joint, with three other well-known market hunters, was detected on October 15, 1918, the day previous to the opening of the season, with 226 ducks and one snipe in his possession. Information was filed against these four defendants, Charles Guernsey, J. T. Maley, Frank Chambers, and Joe P. Meyers. They were indicted by the Federal Grand Jury and were tried by jury on February 4, 1919, at Sacramento, Judge Van Fleet presiding. The jury returned a verdict of guilty in eleven minutes, and the defendants were sentenced to pay $100 each or in default serve 60 days in jail.

Much credit is due state and federal wardens Carpenter and Ludlum, Deputy United States Game Warden E. S. Cattron and Assistant United States Attorney Johnson for the manner in which the case was handled. As this was the first case in California under the Migratory Bird Treaty Act, Judge Van Fleet did not impose a maximum fine, but warned all future offenders to beware.

GEO. NEALE.

MENDOCINO RANCHER MAKES GOOD KILL.

Mr. Frank Williams, a sheep rancher of Calpella, Mendocino County, recently succeeded in killing a black bear which had been killing sheep in the vicinity for several years. It weighed 300 pounds. A mountain lion was killed the same day. (See Fig. 32.) During the winter of 1913 seven lions were killed in this vicinity.

Fig. 34. Mountain lion and large black bear which had pestered sheep-men for years at last rounded up in one day by Frank Williams, a rancher of Calpella, California. Photograph by Una Boyle.

GAME LAWS TO BE ENFORCED IN NATIONAL FORESTS.

Persons who violate the state game law on national forests now become liable to prosecution in the federal courts. A regulation recently issued by the Secretary of Agriculture is as follows:

"The going or being upon any land of the United States, or in or on the waters thereof, within a National Forest, with intent to hunt, catch, trap, wilfully disturb or kill any kind of game animal, game or non-game bird, or fish, or to take the eggs of any such bird, in violation of the laws of the state in which such land or waters are situated, is hereby prohibited."

BEAVER HIDES CONFISCATED.

Deputies Newsome and Sellmer, while on patrol work along the Tuolumne River, discovered 14 green beaver hides in the camp of a trapper. The trapper, fearing the hand of the law, had fled. If the attempts being made to locate the trapper are successful, prosecution will follow.

DEPUTY ACQUITTED AT TRIAL.

Deputy Carpenter of Maxwell, Colusa County, was recently made defendant in a suit to compel payment for seventy-three ducks which he seized from three Colusa market hunters. The commission's attorney, R. D. Duke, handled the case in a masterly way when it came to trial by jury at Colusa on February 11. Attorney Duke contended that the justice had no jurisdiction in the case and that it should be tried by a federal court, but he was overruled by Justice of the Peace, Moore. Nevertheless, the outcome was a verdict in Deputy Carpenter's favor. This vindication of the game laws by a jury in Colusa augurs well for the future.

WAR-TIME SAVING IN COST OF FISH FOOD.

The furnishing of proper food to the millions of fish reared in our hatcheries is no small problem. Until the cost made it prohibitive, beef liver was largely

used in the preparation of fish food. With the increase of cost wholesale in San Francisco from 5 cents to 12 cents per pound, it became necessary to seek a substitute. This was found in refuse fish costing but 4 cents per pound. A product of a fish reduction plant known as cracklings has been found usable, but hardly as satisfactory as beef liver.

THE PACIFIC COAST WHALE INDUSTRY.

It is reported that in 1918 the principal whaling company on the Pacific Coast, with stations in Washington, British Columbia and Alaska, took 999 whales, of which about 200 were of the set species (*Balaenoptera borealis*), whose meat is light colored and particularly good for canning. One right whale was captured; it yielded 1,600 pounds of excellent baleen. Four samples of this baleen, 8 to 9 feet in length, have been sent to the bureau for exhibition purposes. The short baleen of the common shore whales, which in recent years has been thrown away, now has a fair market value, and large quantities of the discarded material are being profitably salvaged.—*Fisheries Service Bulletin*, No. 45.

FOOD ADMINISTRATION REGULATIONS ON FISHING NO LONGER EFFECTIVE.

All of the rulings of the Federal Food Administrator regarding the commercial fisheries of the state, with the exception of that relating to the packing of sardines, were revoked on December 31, 1918. The laws of this state are now in full force and effect as they were previous to the rulings of the Food Administrator.

MORE BIRD TREATIES NEEDED.

Conservationists having successfully provided for the protection of migratory wild fowl which breed to the north of the United States are now demanding a similar protection for the waterfowl and insectivorous birds which summer in the United States, but spend the winter season in Latin America, where they are wantonly slaughtered. As a sample of the type of destruction which goes on in Mexico, we quote from a letter written by H. S. Battie of Hollywood, California:

"Regarding the market shooting, I refer solely to ducks; except the egret, no other feathered game is shot for the market.

"As you may not have heard of the methods of shooting ducks for market, I will explain it.

"In the table lands of Central Mexico nearly all the large haciendas have ponds or lakes to catch water during the rainy season which is later used for irrigation. During the winter the ducks congregate in immense numbers on such places.

"At a convenient place on the bank a frame of heavy timbers is laid, and to these are fastened batteries of guns—anything that will shoot, in some cases iron pipe being used. They sometimes have three tiers, fan-shaped, one above the other, and perhaps a hundred or more guns, the first aimed at the water, the second slightly above, and the third slightly higher still. These are fired by trains of powder.

"On the day selected the peons go in boats, and also wading, gradually driving all the ducks on the lake into a compact mass in front of the battery. At a signal the boats back away and the peons duck under. The first tier is fired as the birds are sitting and the other two a fraction of a second later as the birds are taking wing. The slaughter is dreadful. I would not care to say just the number, but an American friend who happened to be at an hacienda at the time, told me they got two thousand that day. I had no reason to think he exaggerated."

While interest is still strong regarding the protection for migratory and insectivorous birds effort should be made to give the summer visitant class of birds equal protection with the winter visitants. Not only will the carrying out of such a program of protection be a benefit to the citizens of today, but will be a benefaction to the coming generations.

CONSERVATION OF FISH.

Former visitors to Santa Catalina Island, who remember seeing tons of albacore, tuna, and black sea bass spoil on the pier and then towed out to sea, will be interested in reading the report of the Avalon Fish Exchange. All fish caught by anglers and not utilized by them becomes the property of the Fish Exchange. This supply is augmented by market fishermen. Last season 165,000 pounds of edible fish were shipped to the mainland. This was in addition to the large amount sold on the island. Included in the shipments to the mainland were 92 giant bass, fish which formerly went to waste, but which now are in great demand. Anglers trolling in Catalina waters used

15,000 flying fish as bait. Valuable data as to the time of year when the different varieties of fish are in abundance is being accumulated by the exchange.

DEPENDABLE INFORMATION IS NEEDED.

Honorable George D. Pratt, Conservation Commissioner of the state of New York, has recently called attention to the need for precise and dependable information about wild life resources. He points out that the underlying cause for the multiplicity of laws relating to game offered at each session of the different state legislatures is inadequate information regarding game conditions. In attempting to fill this need, Mr. Pratt instituted in 1915 a game census designed to furnish a running check upon the condition of the state's wild life. By leaving out of consideration unprovable assertions or estimates based upon guesswork or the unreliable method of averaging, the census gives definite knowledge regarding general abundance of different species in different sections and the fluctuations in their condition from season to season. Each of the 140 field men have been required to report upon cards every week all of the game that they have seen and the conditions under which that game was existing during that week.

On the deer card, spaces are provided for recording the number of bucks, does, and fawns, damage to crops, distribution, physical condition and food supply. Other cards provide for data regarding game birds and waterfowl, fur-bearing animals, and predatory animals and birds, with appropriate remarks. As a result of a study of the deer cards, it has been possible to draw definite conclusions regarding relative proportion of the sexes and the extent to which they are breeding.

As a means of gathering additional statistics, every holder of a hunting license when applying for a new license will hereafter be required to give in addition to his name, residence, personal appearance, etc., the amount of game that he killed under his old license. This will give an approximate measure of the amount of game actually killed and will give a basis for demonstrable facts. With these facts at hand, wise laws can be maintained on the statute books, and changes will be brought about only as rapidly as actual changes in the condition of wild life justify modification of the law.

When Vermont inaugurated the same system it was pointed out that the value of such a census would be threefold:

1. The warden force will be educated in local conditions and brought into closer harmony with the sportsmen.

2. A basis for wise legislation will be secured for the protection and conservation of a resource of real value in terms of dollars and cents.

3. The educational value to our people as increasing their interest in, and cooperation with, the work of the Department of Fisheries and Game.

STATE GAME DISTRICT 1K.

In connection with the Sequoia Park extension bill introduced in the present session of Congress, which proposes to extend the present boundaries of the Sequoia National Park to include the South and Middle Fork canyons of the Kings, it is worth while, perhaps, to consider the effect that the passing of this bill would have on the game situation in the Sierra and Sequoia National forests, and particularly on the State Game Refuge 1K between the north and middle forks of the Kings.

Nearly one-third of the area of Game District 1K is within the boundaries of the proposed park extension, and as other areas suitable for the propagation of game are also included, and the park regulations do not permit hunting within the national parks, it is only reasonable to suppose that some action may be taken to try to have the present game district abolished, on the grounds that the park will amply provide for all the game protection needed in this part of the mountains.

The fact will still remain, however, that no other area is so favorably situated with regard to ideal conditions for winter breeding grounds as the low brushy southern exposures in township 12 south, range 28 east afford. Because of the rough nature of the country and its inaccessibility, there is little probability of attempted poaching, and while a park would provide protection and ample range during the summer season, I believe it would be a serious mistake if the above-men-

tioned township at least is not retained as a game preserve where hunting is prevented at all seasons.

It might be argued that the closed season during the winter months offers all the protection that is necessary; but it would be found, I believe, if the game preserve were abolished, that a large number of hunters would flock to this area in the open season, on the assumption that by this time the deer would be working down from the higher elevations where they had been protected in the park and possibly tamed to some extent.

One other consideration is the open bear season of November and December that offers a legitimate excuse for hunting parties in the brush at that time of year. That is the one time when poaching might be carried on, for only a few hunters could resist the temptation to kill some of the numerous bucks they would undoubtedly see, especially since the chances of detection are so small without the continuous presence of a game warden in the vicinity. It would seem much safer to cut out every excuse for legitimate hunting in these breeding grounds.

ROY BOOTHE.

IS THE PORCUPINE WORTH SAVING?

Evidence that we have not yet standardized our game laws is apparant in the different viewpoints taken by the states of New York and Minnesota regarding the porcupine. The New York Conservation Commission classifies the porcupine as "vermin" and enumerates twenty as having been killed during January, 1919. The state of Minnesota, on the other hand, protects the porcupine on the theory that the animal furnishes an easily obtainable source of food to anyone lost in the wilds.

MANICURE THE BIRD-CATCHING CAT.

Dr. Wm. H. Dall, of the United States National Museum, recently pointed out a method that will save our cats and thoroughly protect the birds against their attacks. It is a well-known fact that these animals only seize their prey through the use of the claws on the forefeet. These claws are, as we know, so organized anatomically that when at rest they are retracted, but when brought into play they are thrown forward, so that their sharp points may be instantly employed in the act of seizure. No cat ever attempts to catch a wild bird in the open by employing its hind feet, or the claws upon them. No lion, tiger, leopard, or any of the rest of the big felines in nature ever do. This also holds in the case of pet cats who kill the canary in its cage, or capture the fish in the globe or aquarium.

When one comes to think this over, it soon becomes clear that, were cats deprived of their claws on their forefeet, they could not catch a bird of any kind, however hard they tried. The claws have no more feeling in them than have our finger-nails, to which they really correspond. Cat claws can be trimmed just as we trim our nails, and the best tool to do it with is the small cutting pliers used by jewelers. Anyone can use such a tool, and with a little practice anyone owning a pet cat can readily trim all the claws on its forefeet. All there is to be done is to gently press the foot from above, downwards, between your thumb and forefinger, when the claws will be thrown forward. They should be snipped off a trifle back of their middles applying the cutting edges of the nippers to their sides. A little dressing with delicate file afterwards will also prove advantageous. A cat so operated upon can not possibly catch and kill a wild bird or a pet bird in a cage; nor can it destroy fish in any receptacle in which we may keep them. Moreover a cat with its claws so trimmed can not climb a tree; it is up in trees that they catch many birds, as they likewise do by running up poles topped with bird boxes and bird houses of every description. After the claws are trimmed the foot looks precisely as it did before the trimming was performed—that is to say, nothing unsightly results.

Some will say that it prevents the cat from catching mice. Well, what of it? There is not one cat in a hundred that catches mice for any purpose; moreover, a few mousetraps of modern models will very quickly rid house, barn, and outhouses of all description of mice. Any of the "cyclone" pattern of traps will do it in a few weeks. Cats with trimmed claws can enjoy their milk and other food just as well as with untrimmed ones, so there is no cruelty done along such lines.

Finally, were we to trim the claws in the manner indicated of all claimed cats, and destroy all cats not claimed by anyone, we would save thousands of insectivorous birds annually; and surely the country has by this time begun to realize what the insectivorous birds mean to the farm and agriculturist generally. A federal law should be enacted to enforce what is indicated in this matter, and be so framed that, when passed, it would be in the highest degree effective.—*Ill. Audobon Soc. Bull.*, 1918.

A PLAN TO CONSERVE WYOMING ELK.

After a very careful investigation of the problems presented by the herds of elk on the National Forests adjacent to the Yellowstone National Park, Henry S. Graves, chief forester, and E. W. Nelson, chief of the Bureau of Biological Survey, have suggested a plan, based on sound biological principles, for conserving this valuable game animal. They propose the maintenance of the present herds, estimated to number from 40,000 to 45,000, and the use of the annual increase for legitimate hunting and distribution to build up other herds. The maintenance of these herds is to be accomplished by the acquisition by purchase or exchange of private land to provide needed additional winter forage, and the setting aside of adjoining areas as game refuges, the progressive extinguishment of sheep grazing privileges to prevent any possible conflict between wild life and domestic stock, the enlargement of the present government ranch in Jackson Valley to provide forage during severe seasons, a vigorous campaign against predatory animals that destroy elk, and state legislation requiring hunters to report the number and kind of animals killed and to preserve and make economic use of the meat. In addition, it is pointed out that a special study of the migratory drift and winter and summer habits of the elk to supply certain facts now in doubt should be instituted.

FUR FARMING IN ALASKA.

The United States Bureau of Fisheries in a recent bulletin (Document 847) gives interesting information regarding fur farming in Alaska. Reports are given on the success attained by no less than 25 different breeders. Fur farming in Alaska is concerned almost wholly with the breeding and rearing of foxes, but some attention has been given to minks and martens, and there are records of martens having been born and reared in captivity in the territory. Although skunks and raccoons have been introduced into Southeastern Alaska, nothing is known as to the success attained.

The history of fur farming in southeastern Alaska is with but few exceptions a history of failures rather than successes. Three good reasons for the failures can be advanced: one, neglect due to irresponsible men left in charge; two, discouragement following failure of the industry to prove a "get-rich-quick" proposition; three, lack of experience and knowledge in handling fur animals. Nevertheless, the opportunities for the fur farmer in Alaska are almost unlimited.

HOW DO BIRDS FIND THEIR WAY?

A lecturer at the California Academy of Sciences on January 15 discoursed on "How Migrating Birds Find Their Way." This lecturer upset all my previous notions that instinct had anything to do in guiding birds on long journeys, and gave numerous instances to prove that birds followed previously observed currents of air and water in their flight, or rose and depended upon sighting distant landmarks through their well-known powerful vision.

As a lover of birds and a former breeder of homing pigeons (usually called carrier pigeons) my observation leads me to believe that the orienting instinct of birds is innate, on the same principle that, biologically, plant and animal life is governed by the influences of light and heat. I cite a case in our late war of bird travel under difficulties. A Lake County man began to raise homers (carriers) for the United States Army in France. Anxious to try out his stock he sent a male fledgling to my home at 1125 Bush street, San Francisco, in a little collar box with a few holes perforated in the cardboard. Wheat lay on the bottom of the box, but the bird was cramped and did not eat it on the rough stage trip from the mountains. When it arrived, it had nothing in its crop and it should have been nurtured, but next day it was taken from the dark box, a quill fastened to its leg

with date, hour, and minute, and released. It barely made the fire wall of the five-story apartment house next door, and sat stretching one leg and wing, then the other, preened its feathers, lifted its head to one side, then the other, rose, circled a few times and darted north. Being of good homing stock, I thought we should hear from it next day, but three weeks passed, then came word that the bird had got home, worn, bedraggled, with a .22 bullet wound through its breast and wing, over which the blood and feathers had matted or had been stuffed in the wounds by the bill of the bird. The wounds were weeks old.

Now, how did the bird exist, and how did it find its way—a young bird, its first flight after a seventy-five mile trip in a dark box, from which it never gleaned sight of a landmark to guide it home to the Switzerland of America if not by some inherent trait? Can CALIFORNIA FISH AND GAME readers elucidate?—JOHN OLIVER TITLOW.

A SUGGESTION FOR CALIFORNIA CONSERVATIONISTS.

It may be of interest to those concerned with the conservation of wild life in California to note that the state of New York number of game and fur-bearing animals ing of additional information as to the number of game- and fur-bearing animals killed in that state. The *American Field* for December 28, 1918, page 593, states that:

"Beginning January 1 all applicants for hunting and trapping licenses in New York State will be required to make a statement of the game and fur-bearing animals which they took under their license for the previous year if they had one.

This information will be tabulated on the stubs of the licenses, which are retained by the town and village clerks and will give to the Conservation Commission accurate information of the greatest value regarding the food and game resources of the state.

Statements of their 1918 catch, which sportsmen make when securing their 1919 licenses, will necessarily be from memory, but to assist them in keeping track of what they take during 1919 a neat little tally card will be supplied when the licenses are taken out, upon which the sportsmen can keep a record during the year.

Both license and tally card will be handed to the applicant in a stout manila envelope, in which he may carry them in the field and keep them clean throughout the year."

It is believed that this suggestion will appeal strongly to Californians. As the tendency toward reduction in the numbers of game and fur-bearing mammals becomes more noticeable, it is fortunate that public opinion is insisting more and more upon scientific administration of the fish and game resources of the state. It is evident that a common sense program of this sort is dependent upon adequate information, and it seems that the method suggested is one which gives promise of valuable results. The writer has been advised by Dr. T. S. Palmer that the method has been given a partial trial by one or two of the provinces of Canada and a similar number of states. The chief difficulty in regard to it is in connection with enforcement. Changes in residence and failure to appreciate the necessity for definiteness in the record are among the complicating factors. It is believed, however, that the adoption of a measure of this sort would be a long step in the right direction. In California this would be particularly true with reference to the fur-bearing mammals, concerning the numbers of which taken during any one season adequate information is not available.—WALTER P. TAYLOR, Biological Survey, Washington, D. C.

THE GAME BIRDS OF CALIFORNIA.

The Game Birds of California (Contribution from the University of California Museum of Vertebrate Zoology) by Joseph Grinnell, Harold Child Bryant, and Tracy Irwin Storer: University of California Press, Berkeley, 1918. Large 8vo., pp. x–642, 16 colored pls., 94 figs. in text. Cloth, $6.00 net.

The volume of the above title is the comprehensive book on the game birds of California that sportsmen, nature lovers, and serious students of bird-life have long needed. The book aims to supply the naturalist with complete information to date regarding the life histories of California birds, to give the hunter useful facts concerning the birds he wishes to shoot, to furnish the legislator with helpful suggestions relevant to the preparation of game laws, and to give the conservationist information which will aid

him in his efforts to perpetuate bird life. The authors took into account all four of these classes of readers and selected and arranged their material accordingly.

Every one of the 108 native game birds of the state is described in detail, these including the ducks, geese, swans, ibises, cranes, rails, snipe, sandpipers, curlew, plover, quail, grouse, pigeons and doves. The localities in which each is found, and the times of the year when it is found, are designated and its life history and habits are accurately described.

The extensive collections and field notes in the California Museum of Vertebrate Zoology, supplemented by previously published knowledge from the experience of ornithologists throughout the West, have formed the basis for the volume. To this groundwork has been added material obtained from interviews with numerous reliable sportsmen and directly from the fresh field experiences of the authors themselves. The whole is worked into what constitutes a practically complete summary of our knowledge of each of the species down to date. The authors do not claim that the book contains everything that ought to be known about each of the game birds of California; far from it, for more extended observations are certain to provide multitudes of new facts. This book should act as a stimulus for future observers, leading them to add to what is now made common knowledge regarding our game birds.

The joint authorship of the book is the working out of the principle that the highest plane of scientific output is likely to be reached only through co-operative effort. When one author works alone, mistakes are made unawares; but when two, or better three, are at work, one is able to check another's work to advantage, and an increased measure of accuracy is the result.

An underlying incentive for the publication of the present work was found in the decrease of many valuable species of game birds and the apparent apathy of the public with reference to instituting proper measures to conserve them. The book adequately treats of the means to be taken to conserve game and makes practical recommendations suited to each species.

Introductory chapters are devoted to general subjects, as follows: Decrease of Game and its Causes; Natural Enemies of Game Birds; The Gun Club in California; History of Attempts to Introduce Non-native Game Birds; The Propagation of Game Birds; Legislation Relating to Game Birds in California. The sportsman and nature lover will find much of immediate utility in these general chapters.

The technical matter useful to the special student of birds is found condensed in small type at the head of each discussion. This makes reference to the finer characters of each species easy, and at the same time segregates this formal matter from the more readable text following.

The plan of treatment of each bird follows a regular sequence: Technical portion (in small type): Accepted common and scientific names; other names; description: adult male, adult female, juvenile, downy young; marks for field identification; voice; nest; eggs; general distribution; distribution in California. Text (in large type): General and local distribution; migration; field marks; life history: nest, eggs, young; habits and behavior; food; economic value; present and probable future status.

"The Game Birds of California" is well illustrated with line drawings and colored plates. Thirteen of the sixteen colored plates were made by the well-known artist, Louis Agassiz Fuertes, and the other three by Major Allan Brooks, now of the Canadian army. In all, twenty-one different game birds are figured in color. The 94 line drawings serve largely to illustrate characters of plumage, bill, or feet, such as are especially helpful in identifying the different kinds of game birds.

As a sample of what may be expected in the treatment of each species, attention may be called to the chapter on the Valley Quail. Twenty-three pages are utilized in describing the bird, its nest, eggs, distribution, field marks, habits and behavior. Here will be found interesting evidence to show that the male birds act as sentinels. A compilation of data on time of nesting and size of clutch occupies over four pages. It is demonstrated that the valley quail lays more eggs than any other game bird, and under normal conditions suffers corresponding mortality.

Means of controlling this mortality are suggested. A discussion of the agricultural bearing, early hunting for the market, and present and probable status of this upland game bird concludes the chapter.

All through the book especial attention is given to those distinctive characters of a bird that help to make it recognizable from other species when alive, at a distance. A useful field manual is thereby provided. A dependable key to the various species makes possible the identification of any specimen in hand. The index contains all the common as well as the scientific names, thus making it easy to locate any bird, provided some name is known, even though this name be a very local, popular one.

Every school and library in the western states should contain a copy of this work for reference use, for more and more is the natural history of bird life assuming importance as a subject of general popular culture. Individuals interested in the fascinating field treated in this work should waste no time in securing copies.

PASSENGER PIGEONS REPORTED IN EASTERN STATES.

Apparently the death on September 1, 1914, of Martha, a twenty-nine year old passenger pigeon kept in captivity in the Cincinnati Zoological Gardens, marked the extinction of the passenger pigeon. At least for several seasons thereafter, a prize offered for the discovery of a passenger pigeon's inhabited nest failed to disclose any pigeons.

During 1918, however, several persons reported seeing passenger pigeons. Baymen and oystermen of Great South Bay insist that a few pigeons still migrate along the southern shore of Long Island, New York.

According to a letter published in SCIENCE, Messrs. Rasmussen, Wilson and Sanders, of Amsterdam, New York, encountered a flock of passenger pigeons on October 1, 1918, while on a bird-study trip in the vicinity of West Galway and Charlton, New York. One of the birds lighted within a few feet of the party, and Mr. Rasmussen, who has been studying birds for 25 years, declares that there is no possible doubt of the identification.

The latest report is from John M. Crampton, 61 years of age, and Superintendent of the Connecticut State Board of Fisheries and Game. He describes having seen three passenger pigeons in the middle of May, 1918, while fishing at Graniss Pond, Southington, Connecticut. He maintains that he had no difficulty in identifying them, for he has been acquainted with the appearance and habits of the passenger pigeon since early boyhood, having been 13 years old when he first shot passenger pigeons, and having had a trained passenger pigeon for a pet for a long time. On June 2, 1918, a Mr. Wooster, who was told of the find, saw three birds, and on June 9, a Mr. Parker saw two birds in the same vicinity.

ENGLISH GAME BIRDS VINDICATED.

Recent investigations of the food of the English pheasant, the red grouse and the partridge of England show that these splendid game birds do not appreciably damage growing crops.* The stomach examination of 183 stomachs of pheasants show that their food consists largely of injurious insects and weeds. This conclusion is of particular interest when it is known that the Board of Agriculture and Fisheries on February 8, 1917, authorized the War Agricultural Executive Committee of each county to reduce the stock of pheasants on any land "where there is a risk of substantial injury therefrom to crops." The only possible harm occasioned by the pheasant for which there seems to be any reliable evidence is that of tramping down corn, and this is not of frequent occurrence, but happens only where birds are unusually abundant.

The food of the young red grouse is made up largely of insects, while that of the adult is largely browse secured from heather and twenty or thirty other plants. So far as agriculture is concerned, the partridge is a harmless bird. The percentage of cereals consumed is small and restricted to a very short season of the year. This is secured largely in stubblefields.

In conclusion, it is pointed out that blame for crop destruction should be fixed upon

*Collinge, W. E., On the food and feeding habits of British game birds. Reprint from Jour. Land Agents Soc., June, 1917, pp. 1-8.

the right species and that the wood pigeon, rook, certain species of gull and the starling have been proved guilty. If birds of the above character are destroyed wholesale the farmer is being robbed of a species that are beneficial, and the real culprits as well as the injurious insects eaten by the game birds, are left to continue their work of destruction of the country's food supply.

THE GROUND SQUIRRELS OF CALIFORNIA.

Anyone interested in the life history or the control of the ground squirrel should obtain a copy of the November-December number of the Monthly Bulletin of the State Horticultural Commission which is available free of charge. This bulletin contains thoroughly up-to-date and unquestionably authoritative information on the ground squirrels of California and their control, compiled by leading state and federal investigators. In the leading article each of the 18 different varieties of ground squirrels known to inhabit the state are treated, and nine of these are figured in color. It is pointed out that only four of these varieties are of special economic importance.

THE FOOD OF MALLARD DUCKS.

A recent bulletin (No. 720) of the United States Department of Agriculture treats of the food habits of the mallard ducks of the United States. Mr. W. L. McAtee, the author, devotes eight pages to an enumeration of the different kinds of food taken by the mallard, the information being based on the examination of 1725 gizzards. The enormous quantities of seeds taken by the mallard duck is evidenced by two stomachs. One contained about 28,160 seeds of a bulrush, 8700 of a sedge, 35,840 of primrose willow, and 2560 duck weeds, a total of more than 75,200. Another stomach contained no fewer than 102,400 seeds of primrose willow besides a number of other items in smaller numbers. "The seeds in this stomach if sowed one in a place and a foot apart each way would suffice for two and one-half acres of ground."

About one-tenth of the food of the mallard is derived from the animal kingdom and nine-tenths from the vegetable. A large proportion of the vegetable food is made up of the seeds of sedges with those of grasses ranking next in importance. About 2.34 per cent of the food of the birds examined was made up of acorns. The animal food consists of mollusks, insects, fishes and crustaceans in order of importance.

Such a detailed report of the food of one of our best game birds is not only valuable in proving the economic status of the bird itself, but should be of help in providing attractive food for wild birds and suitable food for mallards on the game farm.

WILD BIRDS AND LEGISLATION.

Apparently other countries than the United States have suffered from the result of hasty and ill-considered legislation relative to wild birds. In a recent paper by Doctor Collinge, the foremost economic ornithologist of Great Britain, he points out some of the more important statutes passed by Parliament and their ultimate effects upon wild bird life.* The dominant idea throughout early acts of Parliament seems to have been that birds must be reserved and preserved for the king and his retinue, or such favored individuals to whom he pleased to grant licenses.

Practically all of the acts are characterized by selfishness and an utter disregard of the interests of agriculture or horticulture. Among the curious acts are one making it a felony, punishable by death, for a person to wrongfully take the eggs of any "falcon, goshawk, or laner, or the birds of any falcon, goshawk, or laner or laneret," and one providing that "any person who shall take or attempt to take any wild bird by means of a hook or other similar instrument shall be guilty of an offense."

In the summary Dr. Collinge states that a dispassionate and unprejudiced consideration of the facts leads to the following conclusions:

1. That in the past the question of wild bird protection and destruction has never received really serious consideration. The objects sought in most of the acts of Parliament upon the subject have been largely of a selfish nature and not for the good of the country.

*Wild Birds and Legislation, by Walter E. Collinge. Jour. Land Agents Soc., 1917, pp. 278-285.

2. That the majority of these acts have been ill-considered and often hastily prepared; many of them have been repealed and others frequently amended or modified.

3. That no attempt has been made by those who advocate the protection of wild birds, to understand the problem presented by wild bird life. Blindly, and often strongly prejudiced, they advocate protection for all birds, and protection only.

4. That such an attitude is calling forth a deep resentment from those who have to live by the products of the soil, many of whom having waited in vain for repressive measures, *have now taken to destroying wholesale all bird life.*

5. *That the irresponsible advocacy of uniform protection is indirectly contributing more than anything else to the wanton destruction of many of our most useful birds.* "Some of the very greatest friends that our nation has are being destroyed without mercy * * * a defensive force upon which most of our prosperity depends."

6. That the immediate need of the present is for a wide and comprehensive act that will give protection to all non-injurous or beneficial birds, and provide adequate repressive measures for those species which have become too numerous and destructive.

The same condition seems to exist almost everywhere. Realization of the chaotic condition of the game laws due to hasty, ill-considered and constantly changing legislation is not lacking, but the initiative to clean things up and to base game legislation on scientific fact rather than on selfish motive rarely exists.

H. C. Bryant.

FLY LARVAE SUCK BLOOD OF NESTLING BIRDS.

A recent publication of the University of California points out that the nestlings of many of our common song-birds are infested with the larvæ of a fly which sucks the blood.* The fly which is responsible is very much like the common housefly, but is of a metallic blue color. This fly lays its eggs in a newly-occupied nest, and soon the larvae which hatch from the eggs attach themselves to the young birds. Deserted nests usually contain the pupae. Among the common birds whose nests and nestlings were found infested were: the Nuttall sparrow, California purple finch, California linnet, green-backed goldfinch, willow goldfinch, and the California brown towhee. The author of the paper concludes that from 5 to 10 per cent of the parasitized nestlings die from loss of blood.

This discovery doubtless helps to explain the mortality among nestling birds so often noted in the bay region.

*Plath, O. E., A muscid larva of the San Francisco Bay region which sucks the blood of nestling birds. Univ. of Calif. Publ. Zool., 19, 191-200.

IMPORTATION OF QUAIL FROM MEXICO.

The joint regulations governing the importation of quail from Mexico, issued by the Treasury Department and the Department of Agriculture under date of November 13, 1916, were in full force and effect the past season, the entry of quail being permitted from February 15 to April 10, inclusive, and on March 8, 1918, Laredo, Texas, was designated as a port of entry in addition to Eagle Pass, Texas, and New York City. Co-operation was continued with the Bureau of Animal Industry in having a thorough inspection of the birds made during the ten days' quarantine.

The first permit was issued February 20, 1918, and the last, April 4. The number of quail for which permits were issued was 10,500, and the number released from quarantine only 5,205, as compared with permits issued for 42,973, and the release of 32,814 in 1917.

The notably large decrease in the number of quail actually imported during the past year is accounted for by the scarcity of birds in northern Mexico due to drought, and the refusal of large ranch owners to permit the trapping of quail on property owned and controlled by them. Also it is evident that state game officials were reluctant the past year to purchase Mexican quail for propagation because of the severe losses of birds imported during the season of 1917.

Of the 5,205 birds actually released from quarantine only 16 were found dead during the ten days quarantine period, and no case of quail disease was discovered. So far as reports received by the department indicate, there were few losses of birds in shipping. The change of dates

for the importation of Mexican quail—beginning at a later period, February 15, instead of in the fall, as in 1916—has proved beneficial by preventing the birds from reaching the northern states during severe winter weather.—Report of Chief of Bureau of Biological Survey, 1918, p. 17.

FEDERAL MIGRATORY BIRD LAW.

Owing to the prevention of spring shooting during the last few years, under the federal migratory bird law, a great increase in migratory wild fowl has been reported practically throughout the entire United States. The reports state that more birds were killed during the fall of 1917 than in any similar season for many years. With the need of increasing food resources, this increase in game birds, as a result of a federal conservation law, was a practical and opportune return. Continued protection of our wild fowl during the spring will unquestionably continue to increase the returns in food and sport from this source each year.

For administrative purposes under the migratory bird law the United States is divided into 13 districts, under the supervision of 12 inspectors, who, with the assistance of 182 federal wardens, enforce the regulations, in the various states. During the year the commissions of 47 federal wardens were terminated and 49 new wardens were appointed.

The inspectors and federal wardens reported 313 violations of the regulations, which with those of previous years make a total of 1,132 cases on file. All but 29 of these cases, which have been disposed of in court, have been withheld pending the decision of the United States Supreme Court in the case of the *United States* v. *Shauver*, involving the constitutionality of the law. Defects in the law, particularly in that it did not make the possession of birds during the closed season unlawful, and did not confer on inspectors and wardens the power of arrest and search, made it possible for many violators to escape. A further difficulty in enforcement was encountered in the limited number of inspectors, each with an unduly large district. Reports, however, show that violations were more sporadic and fewer birds were killed unlawfully than in previous years.

Voluminous information has been received from state game commissions and others showing that there is an ever-increasing number of waterfowl and shorebirds in most of the states; furthermore, that wild fowl have become unusually tame in spring because they are not molested at that season; and that many thousands are breeding in localities where they had not nested for many years.

The consensus of opinion attributes these greatly improved conditions to the general observance of the federal prohibition against spring shooting which has been brought about through the good will of sportsmen and by the increased activities of this bureau, with closer co-operation of state game authorities.

The friendly attitude of the state game commissions toward the federal migratory bird law has been shown in many ways, particularly in their initiative whereby the state and federal regulations have been brought into harmony. Twenty-three states now have laws making the open seasons on migratory wild fowl similar to those under the federal regulations. Amendments of the regulations were promulgated October 15, 1917, which assisted in unifying federal and state game laws, thus simplifying their administration.

A bill to give effect to the treaty between the United States and Great Britain for the protection of birds which migrate between this country and Canada passed the Senate July 30, 1917. The Senate bill, with amendments, passed the House June 6, 1918, and was then referred to a conference committee. The conference report was adopted by the House June 28, and by the Senate June 29, and the bill was signed by the President and became effective July 3, 1918. Nation-wide interest was manifested in the passage of this legislation, which was secured through the united efforts of state game commissions, sportsmen, farmers, and others interested in the conservation of wild life. The new law contains many excellent provisions necessary for its effective enforcement, and it will be possible to obtain much more satisfactory results under it than have been possible under the original migratory bird law. Canada has already passed an enabling act and promulgated regulations for enforcing the terms of the treaty.—Report of Chief of Bureau of Biological Survey, 1918, pp. 17–19.

LONG RUN OF A TAGGED SALMON.

The United States Bureau of Fisheries has received from John P. Babcock, of the Fisheries Department of British Columbia, record of the capture in the upper Fraser River of a sockeye salmon bearing on its tail a button that had been inserted in marking experiments carried on by the bureau on Puget Sound.

The fish, dip-netted by an Indian at Soda Creek Canyon, British Columbia, on August 16, 1918, had been taken at Village Point, Lumni Island, Washington, on July 19, 1918. Soda Creek is approximately 400 miles from the mouth of the Fraser River, and Village Point is about 70 miles from the same place. Therefore, assuming that the fish moved by the most direct route, the average rate of travel was nearly 17 miles a day.

NIGHT HERONS GAME IN LOUISIANA.

California was for some time noted as the only state in the Union which permitted the hunting of ibis. Louisiana now holds the distinction of being the only state where the night heron is considered a game bird. According to the 1916-18 Biennial Report of the Department of Conservation of Louisiana, the night heron is often utilized as food and the law provides for an open season from November 1 to February 15 with a bag limit of 15 birds. Both the black-crowned night heron and the yellow-crowned are found in the state, and both are popularly known as "Gros-becs." The young while in immature plumage are particularly sought after by hunters and that is why when served *sautes a l'oignon* it is considered a dish "fit for the gods."

CALIFORNIA TROUT.

What kind of a trout did I catch last summer?

An answer to this and like questions will be found in the July number of CALIFORNIA FISH AND GAME which will be a TROUT NUMBER. The colored plates will make identification of trout easy. Watch for the TROUT NUMBER.

FACTS OF CURRENT INTEREST.

The first case made under the Federal Migratory Bird Treaty Act resulted in the conviction of four violators and a sentence of $100.00 fine or 60 days imprisonment.

The work of the deputies in the duck country has been greatly simplified the past year. Fear of the federal law has resulted in few violations.

Whistling swans were abundant in western Stanislaus and Merced counties during the latter part of the open season, but left about the first of February. Several parties who could not forego the excitement of taking a shot at these beautiful birds were apprehended by deputies, and severely fined.

The Sacramento Orphanage and Farm, the Sacramento County Hospital, and the Registrar of Charities, have recently been the recipients of 631 ducks confiscated by deputies during the open season on waterfowl.

The attempt of market hunters to make shipments of ducks to parties in San Francisco whom the shippers did not know was frustrated by deputies of the commission. The old stunt of shipping under fictitious names is not so easily worked as it once was.

Ring-necked pheasants have become so numerous in Inyo County that residents are demanding an open season.

Large catches of herring have been made this spring and this fish has been selling as low as four cents a pound, retail. Even at this price the demand is not sufficient to prevent tons of herring going to the fertilizer works.

The new hatchery on Fall Creek, a tributary of the Klamath River, has been turned over to the Fish and Game Commission by the California-Oregon Power Company and it is now in full operation.

J. C. Bruce of Wawona, who was recently appointed state mountain lion hunter, killed three of the animals on his first day's hunt in Tuolumne County. Mr. Bruce made his record near South Fork Camp and was assisted by his trained varmint dogs. He will remain in Tuolumne County a month and then go to Shasta County to continue the work.

The salmon catch in 1918 was unusually large, exceeding 12,800,000 pounds.

HATCHERY NOTES.

W. H. SHEBLEY, Editor.

Mount Shasta Hatchery.

Approximately ten million quinnat salmon eggs have been shipped to the Mount Shasta Hatchery from the United States Bureau of Fisheries station on the Sacramento River tributaries and from the Klamath River Station, which was operated this year by the California Fish and Game Commission. The eggs have all been hatched out and the fry will be distributed in the upper reaches of the Sacramento and Klamath rivers as soon as they are of suitable size. A considerable number will be held in the three large salmon-rearing ponds at the hatchery over the summer months, and released after the first fall rains.

Loch Leven and eastern brook trout egg collecting operations at the Mount Shasta Hatchery were very successful this season. There are 1,300,000 eastern brook and 3,000,000 Loch Leven eggs and fry on hand at the station at this date.

The rainbow egg-collecting season is a little late this year, there being only 69,000 eggs of this species on hand at the hatchery on March 1.

Mount Whitney Hatchery.

A supply of eastern brook and Loch Leven trout eggs have been shipped from the Mount Shasta Hatchery to the Mount Whitney Hatchery and the fry resulting will be reared and distributed, together with the other species of trout fry handled at this hatchery this season, in the waters of southern California, Tulare and Kern counties.

Work on the improvement of the grounds at the Mount Whitney Hatchery is progressing nicely, much of the preliminary grading and filling-in work having been completed.

Mount Tallac Hatchery.

Arrangements are being made to open the Mount Tallac Hatchery about the middle of March, and an effort will be made to take the usual number of black-spotted trout eggs this season.

Fort Seward Hatchery.

Quinnat salmon eggs to the number of 1,000,000 have been shipped to the Fort Seward Hatchery, and the fry are being reared for distribution in the Eel River and tributaries, Mad River, and tributaries of Humboldt Bay. The usual number of steelhead trout eggs will be shipped to Fort Seward Hatchery this season for distribution in streams of the north coast counties.

Almanor Hatchery.

Egg collecting operations at the Almanor Hatchery were commenced the middle of February. The run of rainbow trout in that section is late this season, and to date no eggs have been taken.

Domingo Springs Hatchery.

This hatchery will be opened up the middle of March and it is expected that the usual take of rainbow trout eggs will be obtained from this station.

Snow Mountain Hatchery.

On February 1 a crew was sent to open up the Snow Mountain Egg-collecting Station and Ukiah Hatchery. Practically all the eggs taken this season at Snow Mountain will be transported by auto truck to Ukiah and "eyed" at that station, as there are better facilities for handling the work at the latter place.

Bear Lake Hatchery.

Arrangements are being made to open up the Bear Lake Hatchery during the fore part of March, and the crew is all ready to proceed as soon as it is possible to get into Big Bear Valley.

Brookdale Hatchery.

Egg-collecting operations were commenced at the Scott Creek Station during the fore part of February, and while the run is a little late, as in other sections of the state, nearly a half million steelhead trout eggs have been taken to date. They are being immediately transported to the Brookdale Hatchery, where they are being "eyed." The usual number of trout fry will be hatched at Brookdale Hatchery for distribution in the streams of Santa Cruz and Santa Clara counties. An additional supply of trout fry will be retained at the Brookdale Hatchery and held in the rearing ponds for distribution during the late summer months in the streams of San Mateo and Marin counties.

Fall Creek Hatchery.

Fall Creek Hatchery, which was constructed by the California-Oregon Power Company, and turned over to the California Fish and Game Commission in lieu of the construction of a fish ladder over the Copco Dam, is in active operation at the present time.

Egg-collecting operations at the auxiliary stations located on Bogus Creek and Camp Creek were commenced during the middle of February, and to date a total of 600,000 eggs have been taken.

A little over a million quinnat salmon eggs were shipped to the Fall Creek Hatchery from the Mount Shasta Hatchery, and the fry resulting from this shipment will be reared and planted in the Klamath River as soon as they have reached the proper age.

Yosemite Experimental Hatchery.

Troughs and fishcultural paraphernalia have been constructed for the Yosemite Experimental Hatchery and plans made to operate early this spring to determine the suitability of the water for hatchery purposes on a large scale in the Yosemite Valley.

Fish Distribution.

In preparation for the season's fish distribution work, Fish Distribution Car No. 01 has been placed in the car shops at Sacramento for extensive repairs. Arrangements are being made for a very early distribution of trout fry this season.

COMMERCIAL FISHERY NOTES.

N. B. SCOFIELD, Editor.

Biological Stations Want Protection.

Much of our dependable information regarding marine life comes as the result of carefully planned experiments at the various biological stations along the coast. Oftentimes marine plants or animals are taken from their native habitat and planted near the station where they can be watched and studied. Valuable experiments which have been started have sometimes been made worthless because of the removal of specimens by thoughtless people. To avoid recurrences of this kind the various stations are asking for a law prohibiting the catching or removing of marine plants or animals within one mile of any marine biological station. In view of the facts as stated above such a law seems reasonable.

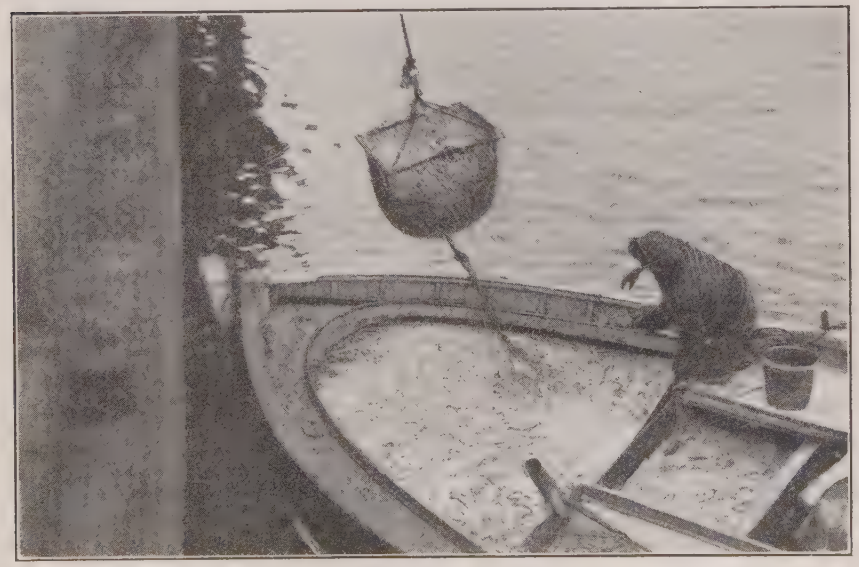

Fig. 35. Unloading sardines at Monterey, California. Photograph by Carriel.

Proposed Change of Shrimp Law Would Menace Fish Life.

Attempts are again being made to modify the present shrimp law to allow shrimp fishing in the northern part of San Francisco Bay. Shrimp fishing is now limited to the south bay in order to prevent the destruction of valuable food fish. In order that the Fish and Game Commission might be in possession of facts to oppose the change several hauls of a shrimp net have been made near McNear's Point. Many young striped bass and other young fishes were taken in the hauls and these will be preserved in the form of evidence.

Launch "Albacore" Attempts to Aid Fishermen.

Canneries at San Diego, although well supplied with large sardines, have been short of small-sized ones, which are in great demand. The Fish and Game Commission launch "Albacore" recently spent some time attempting to locate schools of small sardines. The launch had little better success than the regular fishing boats. Where the small fish are located is still a mystery.

New Cannery Established at Ensenada.

The Mexican Industrial Development Company is building a new cannery at Ensenada, Mexico. This company plans to can albacore, crawfish, turtle, and tuna. They will also ship fresh fish to San Diego.

Japanese Trawler in Nets of Law.

One of the first arrests for dragging trawl nets within the three-mile limit that has been made since the food administration's rulings lapsed at the first of the year was recently made in southern California by Deputy H. B. Nidever. Although the Japanese crew aboard the fishing boat "California" of San Pedro cut away their net on finding that they were pursued, they were, nevertheless, rounded up. After a three and a half hour search the specially-designed salvaging gear of the launch recovered the abandoned trawl net. Evidence of the destructive feature of the trawl net was apparent in the large number of fish of many different varieties found in the net. It is because of the large hauls possible with such a net that its use is prohibited in shallow waters.

NOTES FROM THE LONG BEACH LABORATORY.

By WILL F. THOMPSON and ELMER HIGGINS.

Among the rare fish which have come into the laboratory and have not been recorded in "California Fish and Game," is a specimen of what we may term "square-tail" for lack of a common name. It is scientifically known as *Tetragonurus cuvieri* Risso. The individual is mounted, fourteen and a half inches long, and somewhat badly preserved because of frequent handling. The exact locality can not be discovered, the fisherman who owns the fish having forgotten it, but it was near Catalina. This is the first record of the species in the North Pacific. It was taken two years ago or more.

It is characterized by two sharp ridges on each side of the tail, which is deeply forked. These ridges are formed by the hard, rough scales, and appear capable of giving a severe injury. The scales over the whole body are very hard, with fine striations on them, and seem to be fastened together in oblique rows running across the body, so that one might be able to tear them off in strips. The mouth is small, and the fins feeble in appearance, while the teeth show plainly that the species is not capable of attacking large prey, for they are small and comb-like although numerous.

Although there are very early records of its presence in the Mediterranean, yet it is even there a very rare fish. It was probably known as early as 1554, for Rondelet, a writer of one of the very earliest natural histories, published a crude figure, calling it *Mugil niger*, which may well have been this species. Aldrovandi, a later writer, called it *Corvus niloticus*. Willoughby, in 1686, also described it. But the first author giving a description of what is without doubt this fish was Risso, in 1810. Since the time of Risso, the fish has been taken several times in the Mediterranean and near the Madeira Islands. Other specimens have been taken near Woods Hole, Massachusetts, and one has been taken in Aus-

tralia. The specimen here mentioned is the first from our coast line, indeed the first from the North Pacific. We have also a number of specimens which are very small, up to an inch and a half in length, which we have taken in the small meshed nets used by the boat "Albacore," and which are very probably this species. If so, the species must be very abundant instead of very rare, and its rarity must be ascribed to the fact that the fishermen do not take it with any of their gear.

It is said, by the European writers who have chronicled its appearance, that it is at times very poisonous. It is thought to feed on jellyfish and such animals, and to approach the coast in the fall in order to spawn. When it is taken it is usually very inactive and feeble in its movements, probably because it is far from its own native habitat, which is thought to be the very deep sea.—W. F.T.

During the work of the "Albacore" there have been taken several very odd forms of fish. Notable among them is a fish with stalked eyes. It seems to be the same species as one which has been taken in the Indian Ocean, and which has been called *Stylophthalmus paradoxus*. The eye stalks are very long, being one and a quarter times the length of the head. The eyes are set on the end of these long slender stalks, and give a very peculiar appearance to the fish. One must be at a loss to know the use to which such eyes could be put. The fish itself is but two and a half inches long and as transparent as a jellyfish, with black dots along the whole of its very slender and delicate body.—W. F. T.

The fish known as the "King of the Salmon" in textbooks dealing with fish, a member of the genus *Trachypterus*, is supposedly very rare. But in the explorations of the "Albacore" numerous young have been taken. It would seem that it is another of those fish which are not taken by the fishermen, and an instance in which it is obvious that the common belief that a fish is rare because the fishermen do not take it, is wrong.

It is undoubtedly true that it is not possible to obtain accurate samples of the life in the ocean, either by commercial or scientific fishing, when the adult fishes are concerned. There are assuredly species which are never taken by any form of gear save when they are disabled or when they accidentally leave their habitats. It must be just as true that species which are abundant at times are capable of hiding themselves or avoiding the available apparatus used for fishing so completely as to give the impression that the species has left the region. The accidental discovery of such cases should render us very cautious in our conclusions regarding the relative abundance of a species in a region, or the migrations which they undertake.—W. F. T.

A species of sanddab hitherto supposed to be confined to Mexican waters has been taken by the "Albacore" in considerable numbers a few miles south of Oceanside and also by fishermen in the region of San Diego. This species, *Citharichthys xanthostigma*, rather closely resembles the sand dab of the San Francisco markets, but is a wider, plumper fish, equal if not superior in quality to its northern relative. It may prove very important commercially.—E. H.

Another interesting specimen taken by the "Albacore" in one of her scientific collecting trips is that of a flying fish, new to these waters. The specimen, of the species *Exonautes rondeletii*, was taken some 150 miles off San Diego; and although the species is of wide range in tropical seas, it has heretofore been recorded on this coast only from Acapulco, Mexico, 1700 miles to the south.

Southern California is supposed to yield but one species of flying fish—the one so well known to the sportsmen-anglers of Catalina Island; and whether the new fish is a permanent resident hitherto undistinguished from the common species, which it closely resembles, or another visitant from the south is still a doubtful question.—E. H.

During February the "Albacore" landed Mr. Horace Linton on San Nicholas, a bleak and desolate island off the southern California coast, for the purpose of making some investigations on the abalone. Mr. Linton is a man over sixty years old,

but he intends to live on the island alone for three months and carry on his observations. He expects to look for abalones which he marked and "planted" there six years ago and also to mark many more. He believes that the supply can be increased by intelligent thinning out and transplanting, but whether or not he succeeds in raising the supply to an extent which will be of commercial value, his observations may throw some light on the habits of this most desirable mollusk.

E. H.

The noting of unusual species in southern California seems to have impressed many people with the opinion that the year 1918 has been a very unusual year. It is very probable that it is such a year, but it is here desired to call attention to the fact that this is the first year during which the Long Beach laboratory of the Fish and Game Commission has been actively watching for unusual species, and that aside from the observations which have been contributed to "California Fish and Game" from it, there have been very few rare species noted, from that vicinity. The popular saying in southern California that "every year is an unusual year in California" comes to mind in this connection, and one must of necessity be very cautious in concluding that last year was any more unusual than the preceding years have been.—W. F. T.

During the past four months the "Albacore" has had the opportunity to take several trips for scientific purposes. On November 26 and 27 one was made to Catalina Island and return to haul for young fish and eggs; November 30 to December 7, a trip was made to Point Concepcion and return to obtain flatfish by bottom trawling; December 8 to 10, the trip to Catalina Island was repeated; December 11 to 14, the coast from San Pedro to San Diego was prospected for flatfish; February 3, 4 and 5, a trip was made to San Nicholas Island with Mr. Linton, to haul also for young fish and eggs over deep water; and February 6 and 7 were consumed in a trip to Newport to do bottom trawling in the bay. The next trip for scientific purposes should begin about the first of March. These trips have been very largely for the purpose of exploration, and beginning with the March trip, it is hoped to take regular trips over a definite route, in order to follow the development and drift of the pelagic young and the eggs, and to observe carefully three chosen flatfish grounds.

The work in the laboratory has been along lines followed for some time past. The correlation between the temperature, or weather, and the catch of albacore has been carefully analyzed for the year 1915, and a very high degree found. It will be remembered that some work has also been published for the year 1916—for instance in the Pacific Fisherman for June, 1918, and in a previous number of "California Fish and Game." The data for 1917 is now undergoing a similar analysis. The work on the natural history of the albacore is also steadily progressing along other lines, but until the observations to be made this summer are complete, it is not likely that a final report will be made. A preliminary report on several subjects will probably be made soon. In regard to the sardine it may be mentioned that examinations have been made of the state of maturity at various times, and the progress observed to be the same as was carefully followed last year.

Our thanks are due the Zoology Department of Stanford University for the privilege of using the library and collection of fishes belonging to that institution, and more particularly to Dr. C. H. Gilbert for his personal advice and assistance to Mr. Higgins during his recent visit there.

CONSERVATION IN OTHER STATES.

WARDENS DO DETECTIVE WORK IN NEW YORK.

The New York Conservation Commission has been detailing game protectors upon secret service work in the Adirondacks. They operate under concealed identity, in the manner of detectives, in every branch of police activity. The work that they did and the results accomplished are believed to be more extensive than in any similar task ever before undertaken in the cause of game protection. The reports turned in by these men gave the Conservation Commission the necessary knowledge and power, for the first time in the history of game protection in New York State, to deal adequately with the condition of lawlessness in the deer forests.

ILLINOIS SPORTSMEN DISSATISFIED.

The *Illinois Sportsman*, the official organ of the Illinois Sportmen's League, continues to rap the migratory bird law and accuse the Biological Survey of unfair treatment to the sportsmen of the Middle West. According to a recent number of the paper the lack of ducks during the past open season is due to the working of the present federal law which does not allow early spring shooting, but does allow, according to this paper, the slaughter of a large number of birds in Texas and in other states. The paper also tries to point out that the dismissal of the appeal to the United States Supreme Court for a decision on the constitutionality of the former migratory bird law leaves the Shauver case the supreme law of the land, and questions the immunity of the treaty over review in the courts. It will be remembered that in the case of the *United States* vs. *Shauver*, Judge Trieber held that migratory game when in the confines of a state belongs to the state and not to the public of the United States.

If the sportsmen of the Middle West are actually receiving unfair treatment, it is high time that their case is investigated; but if, on the other hand, they are working selfishly for their own profit and overlooking the general welfare, agitation of this sort should be frowned upon by every one interested in wild life. We are glad that California has so loyally defended the new law which apparently is doing wonders for the preservation of our waterfowl.

WASHINGTON COMMISSION MAINTAINS PERMANENT EXHIBIT.

The Washington Fish and Game Commission maintains a permanent exhibit in the city of Seattle. Aquaria containing many varieties of fish, models of fish ladders, fish screens, preserved specimens of many varieties of fish and shellfish, and an exhibit of fish products form the larger part of the exhibit. Some mounted elk and game birds display the game resources of the state. The offices of the commission are in the same building, and the hundreds of visitors find it easy to have their questions answered.

WASHINGTON WILL OPEN THE SEASON ON ELK.

Of the seven or eight thousand elk on the Olympic Peninsula in the state of Washington, nearly 50 per cent are bulls. In order to reduce this number an open season during the month of November has been recommended to the legislature. Nonresident hunters will be required to hire licensed guides at $5.00 a day, and the license fee will be $25.00 or $50.00. In order that only a limited kill may be made only one animal will be allowed each individual and all the meat must be utilized.

VERMONT PLANS QUARTERLY BULLETIN.

According to their last biennial report the Department of Fisheries and Game of Vermont advocates the publication of a semiannual or quarterly bulletin for circulation among the members of sportsmen's leagues, and others interested throughout the state. This bulletin should give items of interest from the work of the department, and from the wider field of interstate and international activities, in this way moulding and directing public sentiment along the most progressive lines.

Vermont in starting such a bulletin will be following the lead of California and other states which several years ago became convinced of the desirability of such a means of publicity and education.

LIFE HISTORY NOTES.

ELK IN SHASTA COUNTY.

John M. Punnett, a civil engineer of San Francisco, who has recently returned from the Pit River, Shasta County, where he has been in camp with a survey party, reports that in the latter part of November, 1918, a small herd of elk were seen on the mountain side on the north bank of the Pit River. They were observed by all the members of the party consisting of five men. Owing to the speed at which the herd was traveling, the distance between it and the observers and the steep, wooded, brushy character of the country it was impossible to be absolutely certain of the number of animals, but the concensus of opinion was that the herd consisted of one bull and either four or five cows.

Some cattle men who were driving stock out of that part of the country stated that during the past year or so they had repeatedly seen what was presumably the same herd. There is good evidence that the herd ranges on the southerly slopes of the Brock Mountain, between the summit and the Pit River.—M. Hall McAllister.

DEER HUNTING POOR IN MONO COUNTY.

We have no knowledge of any deer having been killed in Mono County during the 1917 season. The season, as changed by the redistricting of California, gives the residents of this county very little chance to kill a deer during open season. The deer range very high in almost inaccessible localities during the month of September, not working down until the season closes.—W. M. Maule.

DEER INCREASING IN TRINITY GAME REFUGE.

In the ten years that I have been traveling at different times over the southern and western part of the game refuge (1-D) I have never seen so many deer. The numerous deer tracks rather gave the impression of a band of sheep wintering there. Hunters complained last hunting season that, as soon as the shooting commenced, all the deer knew the refuge and ran over the line and stayed there. I believe there is some truth in this, from my own observations, but not so much as they would have the general public believe.—G. O. Laws.

GROUSE IN THE SEQUOIA NATIONAL FOREST.

Sierra grouse are found from the 5,000-foot contour to the 11,000 in the Sequoia National Forest. They nest principally at the lower elevations between May 15 and June 15, laying from 8 to 14 eggs. The average brood hatched is about 10. Until the young are fully feathered they feed on and in the vicinity of small meadows, eating principally grass, seeds, grubs and berries. When the young are able to fly they usually migrate to the higher elevations and live principally in thickets and fir timber. When there they feed principally on berries and fir and pine needles. A peculiar thing about them is that they go to high elevations to winter and evidently live entirely on pine and fir needles.—Frank P. Cunningham.

RIVER OTTER PLAYS ON MOONLIGHT NIGHTS.

Lake Leonard, situated in the mountains of Mendocino County at an elevation of about two thousand feet, is a small natural lake with no visible outlet. The past summer on moonlight nights an animal was frequently heard splashing in this lake. Observation between the hours of 2 and 6 a.m. on December 22 disclosed an animal swimming about and playing in the water like a sea lion, suddenly bobbing up, giving huge splashes, playing about a bit, then disappearing entirely for a time. When most boisterous it uttered a sharp little scream or made a noise that sounded like a long-eared dog shaking itself on coming out of the water. It appeared larger than a large dog, and could swim very rapidly. No slides have been noticed along the shore, but the animal's actions left no doubt that it was a Pacific river otter (*Lutra canadensis pacifica*).—Una Boyle.

VALLEY QUAIL WITH EGG IN DECEMBER.

When cleaning some valley quail secured near Jolon, Monterey County, December 21, 1918, I was surprised to find a female containing a well developed egg. Unfortunately, the egg was broken in cleaning, but its presence is nevertheless a fact, as can be substantiated by others to whom it was shown. The eggshell was of a yellowish color, and was situated in the oviduct just ready to be deposited.—Edward L. Bosqui.

WILD LIFE IN RELATION TO AGRICULTURE.

BLACKBIRDS AND RICE.

Blackbirds are a serious menace to rice culture, particularly as an agency in the distribution of water grass seeds. While blackbirds in large flocks frequently destroy large areas of rice during the maturing period, they also congregate along the sloughs where the indigenous millets are found, the seeds of which mature some weeks in advance of rice, and of which the blackbirds consume large quantities. When blackbirds arise rapidly from a slough it has been observed that they carry with them heads and seeds which are dropped into the fields over which they pass.—W. O. Jacobson.

DUCKS DESTROY GARDEN PESTS.

Theodore Kytka, the famous handwriting expert of San Francisco, has for many years successfully reared wild mallard ducks in his back yard. Finding them of value as destroyers of pests he has recently given a number of the birds to friends in order that they may clean the gardens of snails, slugs, and other garden pests.

PHEASANTS DAMAGE CROPS IN INYO COUNTY.

After much observation and many discussions with ranchers in the Owens Valley I am of the opinion, and would earnestly advocate, that either an open season be allowed for the introduced pheasant, or that it be left unprotected entirely. It is becoming a pest here, and the farmers who raise grain or small fruits welcome this bird about the same as they do the English sparrow and California linnet (two great nuisances). I quote one of the ranger's reports: "The pheasants are increasing rapidly in the valley and live on the farmers' crops in the summer time, doing them considerable damage." One of the fruit growers here showed me a few boxes of grapes which he intended to ship, but the bunches had been thinned considerably owing to damage by birds. He stated that the robin and a small gray bird (probably the linnet) did a lot of damage, and that the pheasant was a very wicked bird, hiding under the bushes and eating his grapes whole. One of the ranchers near town tells me that he has seen small patches of corn entirely destroyed by pheasants, the birds eating out the grain just after the plant has sprouted.—E. L. Herzinger.

MOLE EATS ANGLEWORMS.

The stomach of a mole (*Scapanus latimanus latimanus*) killed on September 23, 1916, at Hayward, California, was filled with angleworms cut into short pieces, one-quarter to one-half inch in length. This evidence, combined with the fact that moles kept in captivity devour large quantities of earthworms, indicates that this animal feeds largely upon worms and insects found beneath the surface of the ground.—W. N. Dirks.

California Fishery Products Compiled by Department of Commercial Fisheries—October, November, December, 1918.

Species of fish	Del Norte, Humboldt.	Mendocino, Sonoma, Lake.	Marin.	Solano, Yolo.	Sacramento, San Joaquin.	Alameda, Contra Costa.	San Francisco, San Mateo.	Santa Cruz.	Monterey.	San Luis Obispo, Santa Barbara, Ventura.	Los Angeles.	Orange.	San Diego.	Imperial.	Total.	Mexico.
Albacore								39	5,084		24,982		374		30,479	
Anchovy							5,003		172,788		18,633				196,424	
Barracuda							4,642	7,628	33,476	16,553	292,712		230,949		585,960	410,632
Bonita								180	2,077	2,803	159,866		547,327		712,253	170,013
Bocaccio							2,189	9,968	291,667						303,824	
Bluefish									10,076		185				10,261	
Chilipepper									46,284						46,284	
Carp				1,946	20,601	13,246	2,420								38,303	
Catfish		5,444		3,258	1,519	1,323									11,544	
Croakers											6,987		371		7,358	
Coalfish							150		258		24				432	
Cultus cod	212						41,204	8,763	121,415			457			172,051	
Dolphin											21				21	
Dogfish			3,150			8	68,003	500	4,205		2,963		9,272		88,104	
Flounder			242				43,499	11,883	2,428		1,290		150		59,492	
Halibut	1,183						4,063	4,049	2,798	143,173	146,244	4,210	20,510		326,230	139,234
Hardheads					3,052	9,704									12,756	
Hake							25,819	23,450	1,775		7,205		3,062		64,311	4,247
Herring	2,709		184,992				56,550				190				244,441	
Kingfish							17,264	22,750	4,632	159	243,987	39	1,755		290,596	
Mackerel								353	264,893	217	133,414	1,573	9,833		410,283	11,551
Marlin											261				261	
Mullet														3,582	3,582	1,745
Pike				63	10	2,468									2,541	
Pompano			3				277	66	5,068		2,923				8,337	
Perch	2,676		15,505			90	23,441	4,445	2,147	803	15,876		570		65,556	365
Rock Bass										2,059	181,012	825	18,187		202,083	4,129
Rockfish	926		150				403,850	103,620	84,986	13,442	194,359	8,274	314,292		1,123,899	7,802
Sole							1,006,353	172,414	42,332	30,434	7,700	25	1,745		1,261,003	
Salmon	720,994		1,069	10,978	6,524	12,278	22	15	54						751,934	
Smelt	8,438		4,318			95	11,939	15,983	6,071	8,589	110,440	72,652	12,959		251,484	7,991
Sea bass (white)			10,887				11,641	69,823	11,389	4,030	154,419		10,703		272,892	70
Sea bass (black)									248	961	41,503	248	17,496		60,366	32,588
Sanddabs							172,721	30,777	542		1,472	25			205,537	
Suckers					1,156	260									1,416	

Striped bass			156	16,133	20,989	163,727	1,086							232,094		
Puck shad																
Shad				1,588	1,574	2,765	47							5,974		
Roe shad																
Skip jack							728	155		885,345	133	426		886,787		
Sturgeon																
Sardine						503,400	449,725	22,885,726		8,341,757		785,434		32,960,042		
Skate							45,011			437				45,448		
Surf fish										943				943		
Sculpin								2		5,300				5,302		
Sea trout										1,350	941	12		5,303		
Sheepshead									45	7,129		11,437		18,641	3	0
Sword fish										1,000		580		1,580		
Tom cod							2,943			15,567	61			18,510		
Trout (farm)																
Trout (steelhead)	14,055													14,055		
Tuna								568	135	1,162,611		247,751		1,411,605		
Turbot			2,333											2,333		
Whitebait			692				937	81						1,710		
Yellowtail							19,058	64,712	5,276	2,898,906	1,030	1,378,879		4,378,891	94	188
Miscellaneous							21	19,858	13,374	39,424	3,175	8,833		110,782	124	603
Totals	751,193	5,444	223,500	63,993	55,515	205,964	2,483,571	950,238	24,087,795	242,083	15,115,480	93,607	3,632,847	3,582	47,914,878	1,009,493
Crustaceans—																
Crab (doz.)	634					13	7,886	7						8,548		
Spiny lobster										15,305	112,970	1,082	21,815	151,173	205	272
Shrimp							150,119							150,119		
Ecrevisse																
Mollusks—																
Squid																
Cuttlefish							137	83	1,611		249			2,080		
Clam (Pismo)								185		73,268				73,453		
Clam (cockle)			4,403								1,595			5,998		
Clam (softshell)		257	28,765			57,055								86,077		
Clam (mixed)	8,086		3,565							1,323	4,197			17,171		
Oyster (native), No.			94,200											94,200		
*Oyster (shell), No.			312,293				2,149,575							2,461,868		
Abalones		135							44,229	53,877	50,730			151,971		
Sea snails											355			355		
Mussels						773	513			3,044	1,849			6,199		
Reptiles																
Terrapin				2										2		

*Eastern.

STATEMENT OF EXPENDITURES—Year 1918.

Item of expense	October	November	December
General administration	$1,628 14	$1,650 12	$1,728 47
Research, publicity and education (game)	219 45	210 00	237 23
Printing		424 20	
Fish exhibits			
Game exhibits			
Game farm	348 20	84 06	
Mountain lion bounties	320 00	210 00	580 00
Lithographing hunting licenses	110 48		
Lithographing angling licenses			950 00
Hunting license commissions	2,806 60	833 90	2,179 10
Angling license commissions	1,115 10	1,328 00	1,583 40
Market fishing license commissions	1 50	77 00	37 50
	$6,549 48	$4,823 28	$7,278 70
San Francisco District	$5,986 92	$5,760 10	$5,769 16
Sacramento District	3,849 58	3,932 43	3,948 54
Los Angeles District	2,404 05	2,289 21	2,354 22
Launch patrol	1,146 58	1,310 64	2,284 38
Prosecutions (fish and game)	42 60	107 75	100 00
Crawfish inspection	248 39	200 00	200 00
Winter game feeding			
Accident and death claims	124 04	155 05	124 04
	$13,802 16	$13,755 18	$14,780 34
Hatchery administration	$878 70	$868 24	$743 96
Mt. Shasta Hatchery	8,531 23	2,844 33	2,340 28
Klamath Station	1,429 37	1,397 59	924 05
Mt. Whitney Hatchery	2,095 37	1,090 77	937 77
Cottonwood Lakes Station			
Tahoe Hatchery	222 47	16 85	5 00
Tallac Hatchery	23 17	5 00	7 64
Ft. Seward Hatchery			142 33
Eel River Station	622 65	456 38	443 07
Ukiah Hatchery	14 30		
Snow Mountain Station			
Brookdale Hatchery	92 40	122 15	241 61
Scott Creek Station	31 00	30 00	31 00
Feather River Hatchery			
Almanor Hatchery		10 00	5 00
Domingo Springs Hatchery	81 84		
Clear Creek Hatchery	458 50	38 93	
Bear Lake Hatchery	208 59	300 50	88 32
North Creek Station		721 90	252 19
Wawona Hatchery			
Yosemite Hatchery		120 55	400 51
Fish distribution			
Fish transportation	3 00	3 00	3 00
Screen, fishway and water pollution	211 13	191 87	249 57
Special field investigation			
	$15,057 74	$8,227 06	$6,845 70
Department Commercial Fisheries	2,663 02	3,140 15	2,735 93
	$38,072 40	$29,948 67	$31,340 67
Department of Engineering—			
Launch "Albacore"			
Yosemite Hatchery			

VIOLATIONS OF FISH AND GAME LAWS.

December 1, 1918, to March 1, 1919.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without a license	27	$495 00
Making false statement on application	1	25 00
Deer—close season—killing or possession	11	335 00
Female deer, spike bucks, fawns—killing or possession	5	100 00
Quail—close season—killing or possession		
Excess bag limit	1	25 00
Ducks—close season—killing or possession	2	90 00
Excess bag limit	2	75 00
Shooting ducks from power boat in motion	4	110 00
Cottontail and brush rabbits—close season—killing or possession	1	50 00
Grouse—close season—killing or possession	1	25 00
Rail—close season—killing or possession	1	25 00
Swan—killing or possession	4	75 00
Nongame birds—killing or possession	22	456 00
Shore birds—close season—killing or possession	3	75 00
Night shooting	14	250 00
Trespassing on posted grounds	2	40 00
Trapping without license	2	40 00
Total game violations	103	$2,291 00
Fish.		
Angling without license	5	$95 00
Fishing for profit without license	3	50 00
Clams—undersize	3	75 00
Abalones—close season—undersize, excess limit	34	325 00
Spiny lobsters—close season—taking or possession		
Undersize, oversize	6	140 00
Trout—close season—taking or possession, excess limit	6	180 00
Trout—taking other than by hook and line	3	25 00
Dynamiting fish	1	200 00
Failure to produce license on demand	1	
	62	$1,090 00
Grand total fish and game violations	165	$3,381 00

SEIZURES—FISH AND GAME AND ILLEGALLY USED FISHING APPARATUS.

December 1, 1918, to March 1, 1919.

Game.	
Deer meat	219 pounds
Ducks	476
Shore birds	17
Wild pheasants	2
Miscellaneous game	20
Beaver skins	4
Mink skins	3
Fish.	
Striped bass	58 pounds
Trout	1,825 pounds
Crabs	42
Pismo clams	100
Lobsters	1,311
Abalones	691
Halibut	2,693
Illegal nets	1
Searches.	
Illegal fish and game	9

NUMBER OF DEER KILLED IN VARIOUS COUNTIES DURING THE OPEN SEASON 1917.

District No. 1.

Alpine	12
Amador	50
Butte	---
Calaveras	66
Del Norte	---
El Dorado	60
Fresno	125
Humboldt	36
Inyo	72
Kern	---
Kings	---
Lassen	150
Madera	---
Mariposa	---
Merced	23
Modoc	164
Mono	36
Nevada	150
Placer	36
Plumas	200
Sacramento	51
San Joaquin	---
Shasta	330
Sierra	---
Siskiyou	118
Stanislaus	---
Sutter	---
Tehama	253
Trinity	560
Tulare	300
Tuolumne	250
Yuba	---
Total	3,012

District No. 2.

Colusa	150
Glenn	221
Lake	423
Marin	162
Mendocino	140
Solano	140
Sonoma	---
Yolo	---
Napa	116
Total	1,352

District No. 3.

Alameda	---
Contra Costa	---
Monterey	155
San Benito	121
San Francisco	---
San Luis Obispo	342
San Mateo	150
Santa Clara	300
Santa Cruz	69
Total	1,137

District No. 4.

Imperial	---
Los Angeles	208
Orange	---
Riverside	52
San Diego	30
San Bernardino	95
Santa Barbara	425
Ventura	438
Total	1,248
Miscellaneous	105
Total for year 1917	6,854

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A. HOEN & CO., LITH.

GOLDEN TROUT OF VOLCANO CREEK, SALMO ROOSEVELTI EVERMANN

(DRAWN FROM LIFE BY CHARLES B. HUDSON FROM THE TYPE, A SPECIMEN 11½ INCHES LONG.)